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Title

UNC ENVIRONMENTAL SURVEILLANCE REPORT
FOR THE 100 AREAS -- FY 1982

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UNC ENVIRONMENTAL SURVEILLANCE REPORT

FOR THE 100 AREAS -- FY 1982

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SUMMARY

The UNC Environmental Surveillance Program for the 100 Areas provides monitoring to assist in evaluating the environmental impact of 100-N Reactor facilities, the shutdown reactor facilities, and burial grounds in the retired 100 Areas. The major objectives of the program are to monitor radionuclide concentrations in radiological release pathways, maintenance of a data base for trend analyses, sampling and data for accidental release analyses, and demonstration of compliance with applicable regulations.

The surveillance program consists of sampling and monitoring of several environmental parameters. At 100-N Area, samples of ambient air, groundwater, vegetation, soil, and sediment are collected and analyzed along with direct radiation measurements around the 1301-N Facility and along the river shoreline. At the retired 100 Areas, soil and vegetation samples are collected and analyzed. In addition, groundwater samples are collected and analyzed from several monitoring wells at 100-K Area. Special samples to monitor the potential biotransport of radionuclides may also be included in the surveillance program.

Based on the sampling performed for the environmental surveillance program, 100 Area facilities are in compliance with applicable regulations and there is no significant adverse environmental impact from past or present reactor operations.

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1.0 ENVIRONMENTAL SURVEILLANCE PROGRAM

1.1 Purpose of the Program

The UNC Environmental Surveillance Program for the 100 Areas provides monitoring to assist in evaluating the environmental impact of 100-N Reactor facilities, retired 100 Area facilities, and 100 Area burial grounds on the immediately surrounding environment. The program is designed to evaluate trends in releases to various pathways to the environs from reactor facilities. The major objectives of this program are:

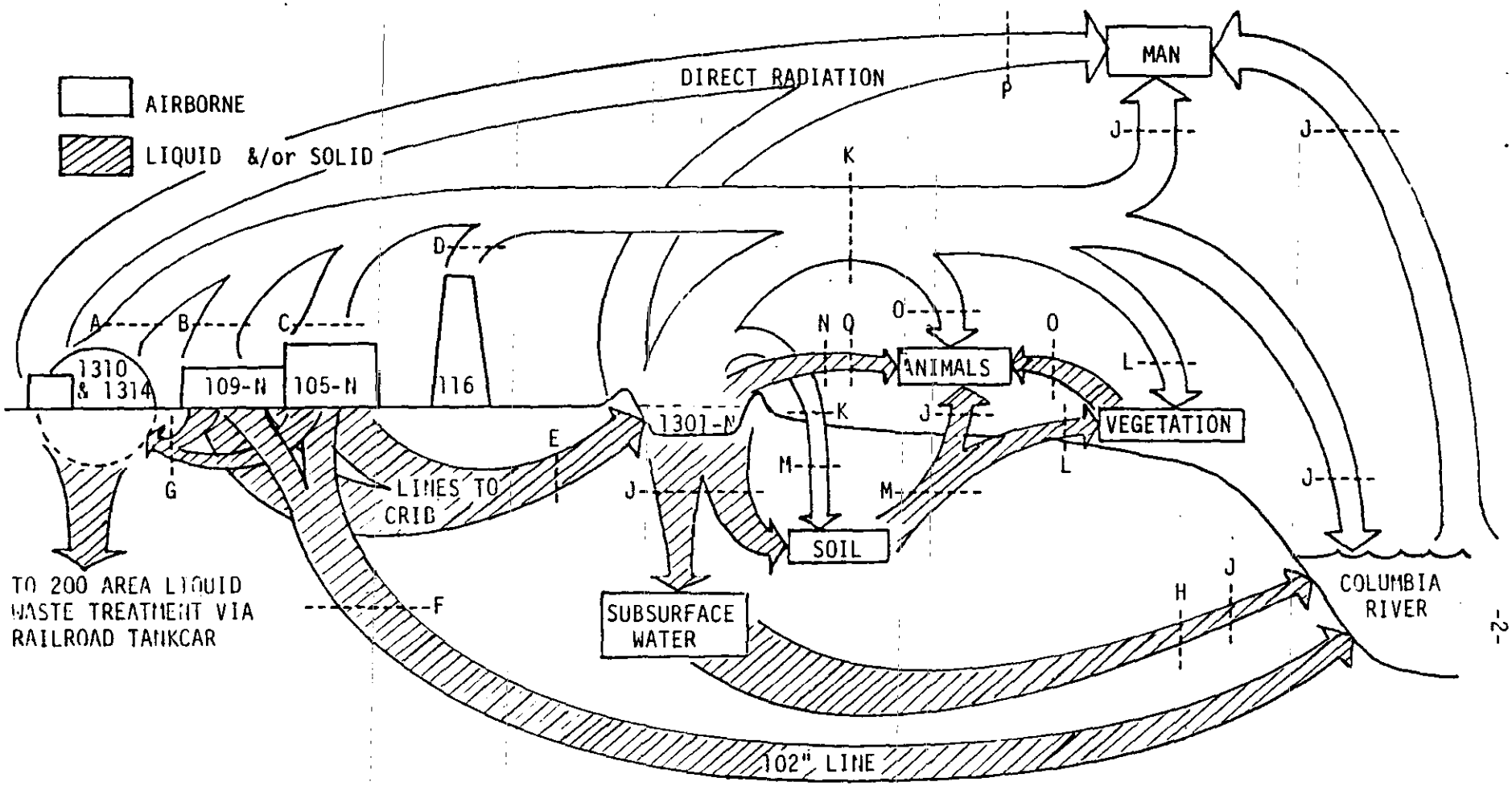
- Detection of radionclide concentrations in identified radiological release pathways.
- Detection and evaluation of changes in the radionuclide concentrations discharged to or existing in the immediate environment. This will serve as a means of detecting system changes or failures, so that appropriate actions may be taken.
- Maintenance of a data base for trend analyses in order to provide the capability for evaluation and response to changes in radioactive material releases from any off-normal or accident condition.
- Provide samples and data to be used for "after-the-fact" accidental release analyses.
- Demonstrate compliance with applicable regulations.

The evaluation of the population dose resulting from the operation of N Reactor is the responsiblility of the Battelle Pacific Northwest Laboratory (PNL). UNC Nuclear Industries supplies radionuclide discharge data to PNL for use in the preparation of these analyses.

In order to establish monitoring requirements, the radiological release pathways from 100-N Area facilities to the immediate environment were analyzed and a flow diagram produced (Figure 1.1). This pathway diagram was used as the basis for the monitoring at 100-N Area in the surveillance program. Similar types of pathway analyses were performed to determine the scope of environmental monitoring in the retired 100 Areas.

The UNC Environmental Surveillance Program for the 100 Areas is summarized in Table 1.1. In addition, special samples to monitor the potential biotransport of radionuclides may also be collected and included in the surveillance program.

The surveillance program for the 100 Areas is continually improved and upgraded. Sampling procedures, techniques, and frequencies are subject to change as more experience is gained in surveillance of the 100 Area environs.



ENVIRONMENTAL BARRIERS OR PATHWAY MONITORS:

EFFLUENT PROGRAM

- A AIRBORNE SAMPLER ON TANK VENTS
- B CONTINUOUS SAMPLING SYSTEM (SEC. 4.1)
- C CONTINUOUS SAMPLING SYSTEM (SEC. 4.1)
- D CONTINUOUS SAMPLING SYSTEM (SEC. 4.1)
- E FLOW PROPORTIONAL COMPOSITE SAMPLER (SEC. 4.2.1)
- F CONTINUOUS LARGE VOLUME SAMPLER (SEC. 4.2.3)
- G SAMPLE ANALYSIS DURING STORAGE & SHIPMENT
- H MULTIPLE CONTINUOUS CONPOSITE SAMPLERS (SEC. 4.2.2)

ENVIRONMENTAL PROGRAM

- J PNL ENVIRONMENTAL PROGRAM (SEC. 2.0 & 5.2)
- K CONTINUOUS AIR SAMPLERS (SEC. 5.1)
- L VEGETATION SAMPLING (SEC. 5.4)
- M SOIL SAMPLING (SEC. 5.3)
- N WIRE MESH TRENCH COVER (SEC. 1.0)
- O 100-N AREA PERIMETER FENCE (SEC. 1.0)
- P TLDs AND DIRECT RADIATION MEASUREMENT(SEC. 5.5)

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FIGURE 1.1. MAJOR RADIOLOGICAL RELEASE PATHWAYS BETWEEN 100-N FACILITIES AND THE ENVIRONS

Table 1.1. Summary of the UNC Environmental Surveillance Program for the 100 Area.

Type Sample	Sampling Method	Number of Sample Locations	Sampling Frequency	Type Analysis
Air Samples	Low volume continuous sampler with particulate filtration and charcoal filter. (100-N Area only)	4	Monthly	Particulate - Gross alpha and beta and major gamma emitters Charcoal - major gamma emitters.
Ground Water Samples	Sample provided to UNC by PNL. (100-N and 100-K Areas)	18	Quarterly	Major gamma emitters.
Soil Samples	Surface soil, approximately 100 cc (All 100 Areas)	28	Annually	Major gamma emmitters. Sr and Pu.
Trench Sediment	Dip samples of ∿25 cc of trench bottom sediment. (100-N Area only)	9	Annually	Major gamma emitters. Sr and Pu.
Vegetation Samples	∿One pound (500 g) sample of vegetation, collected and dried. (all 100 Areas)	31	Annually	Major gamma emitters. Sr and Pu.
Riverbank Springs Vegetation Samples	Same as above (100-N Area only)	4	Annually	Major gamma emitters. Sr and Pu.
Gamma Radiation, 100-N	CaF_2:Mn (TLD-400) Dosimeters (100-N only)	30	Monthly	---
Gamma Radiation Crib/ Trench	Integrated count using hand-held survey instrument (100-N Area only)	27	Annually	---
Gamma Radiation River Shoreline	Same as above (100-N Area only)	50	Annually	---

1.2 Surveillance Program Procedures

Consistency in sample collection techniques is important in comparing different sets of data and validating trend analyses. Specific sample collection, preparation, and analysis procedures are described in Appendix A.

PNL is responsible for the environmental surveillance program for the Hanford Site. It is UNC policy to mimic the PNL sample collection, preparation, and analytical procedure as much as possible to allow maximum comparison of the analytical results between the two surveillance programs.

Measurements in the UNC radioanalytical lab are limited to gamma scans of samples containing varying and unknown concentrations of fission and activation products. To perform the analyses, three lithium-drifted, germainium (Ge-Li) detectors are used. Sample analysis procedures have been established by UNC and documented in Section 2.0 of UNI-M-76 REV1, "Effluent Radioanalytical Program". Strontium and plutonium analyses are performed by the U.S. Testing Company.

The precision and accurancy of radioanalytical instrumentation is maintained thru a laboratory Quality Control Program. The procedures for this Quality Control Program are included in Section 5.0 of UNI-M-76, REV1.

2.0 AIR SAMPLING

Environmental air sampling is conducted as a means of evaluating radionuclide discharges which could result in radiation exposures to N Reactor personnel and trend changes which could be an indication of variations in either the input to a facility or in the functioning of some part of the facility.

A "sampling train", consisting of collection devices, an air mover, and an air flow system is used. The collection device is a standard cartridge sampler (UNC Print H-1-39022). This cartridge contains a 1 cfm orifice, particulate filtration, and a charcoal absorber for halogens. A continuous duty, low volume air pump is installed, along with the cartridge, in a weatherproof enclosure.

Four continuous air sampling stations monitor 100-N Area as shown in Figure 2.1. Samples are collected monthly and analyzed for gamma emitters. The particulate filter is also analyzed for gross alpha and beta. Radionuclide concentrations detected in the air samples are listed in Table 2.1

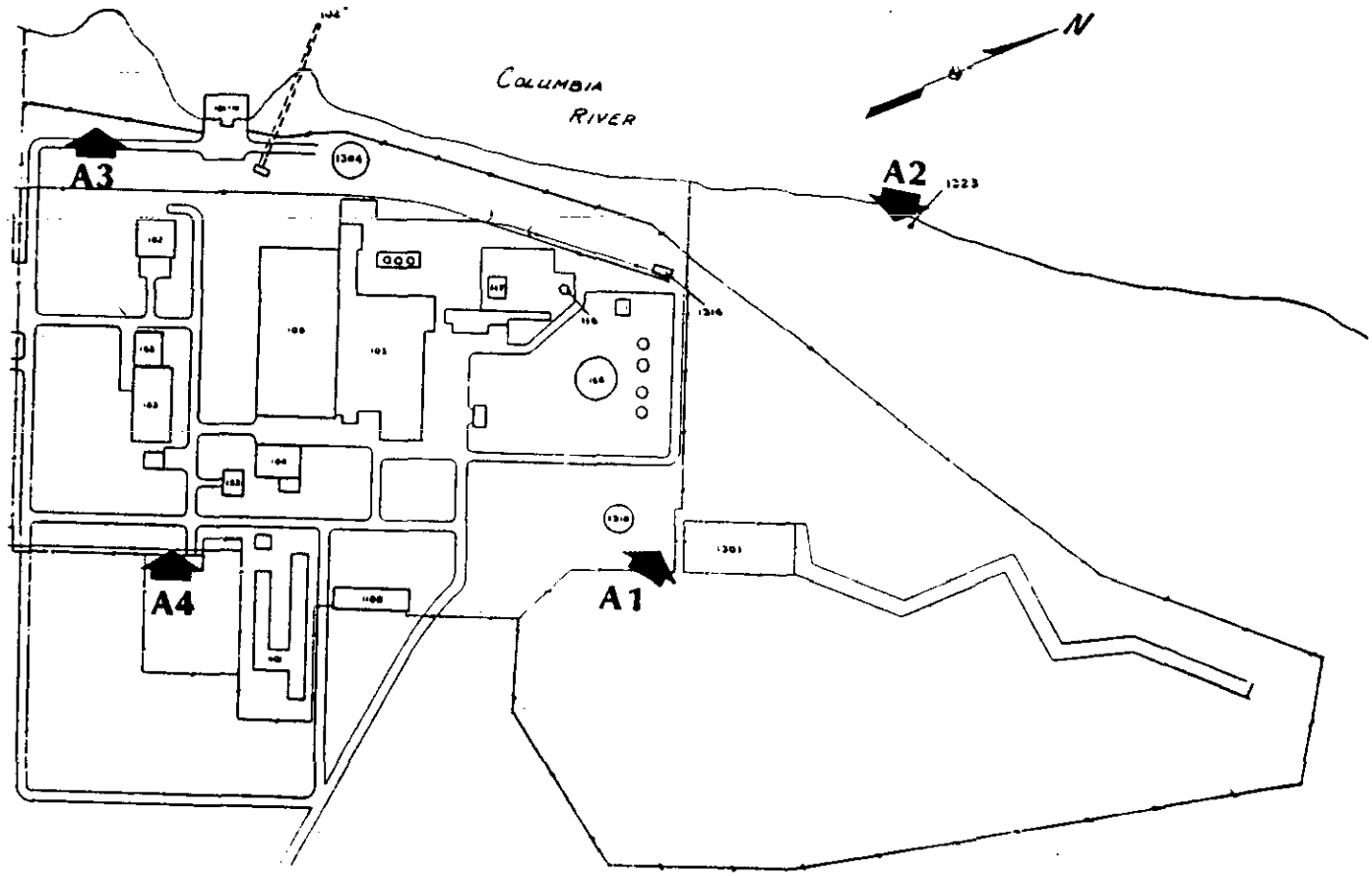

Figure 2.1. Continuous Air Sampling Locations at 100-N Area.

Table 2.1. Radionuclide Concentrations Detected in Air Samples at 100-N Area. Concentrations are in pCi/L.

Sample	Particulate Filter cobalt-60	Charcoal iodine-131
A1	2.9×10^{-5}	8.1×10^{-5}
	9.1×10^{-5}	2.7×10^{-4}
	2.0×10^{-4}	2.8×10^{-4}
A2	2.8×10^{-5}	8.5×10^{-5}
A3	3.6×10^{-5}	Not Detected
A4	1.3×10^{-4}	Not Detected
	1.4×10^{-4}	
	1.3×10^{-4}	

In addition to the concentrations above, 1.8×10^{-3} pCi/L of I-133 and 4.9×10^{-2} pCi/L of As-76 were detected at sample location A1 during one sample run.

NOTE: The concentrations listed above are concentrations detected on individual 4 week sampling runs. With a total of 13 sampling runs of 4 week duration each year, it can be seen from the above data that radionuclides are detected infrequently at the 100-N Area continuous air sampling locations.

3.0 GROUNDWATER SAMPLING

Groundwater sampling is performed at 100-N Area to monitor the movement of radionuclides between the 1301-N crib/trench and the riverbank springs. This monitoring aids in determining the effectiveness of the soil column for entrapping radionuclides. At 100-N and 100-K Areas, groundwater monitoring is also used to help determine the integrity of underground piping, basins, tanks, and other structures holding radioactive liquids.

Nineteen groundwater monitoring wells at 100-N Area and four wells at 100-K Area are sampled by PNL (Figures 3.1 and 3.2). These wells are sampled once every quarter and analyzed by PNL for beta emitters and tritium. Semi-annually, the samples are analyzed by PNL for strontium and gamma emitters.

Each quarter, PNL provides a one gallon sample of water from each well to UNC. These quarterly samples are analyzed for concentrations of gamma-emitting radionuclides. Detectable concentrations of radionuclides in the groundwater samples are listed in Table 3.1.

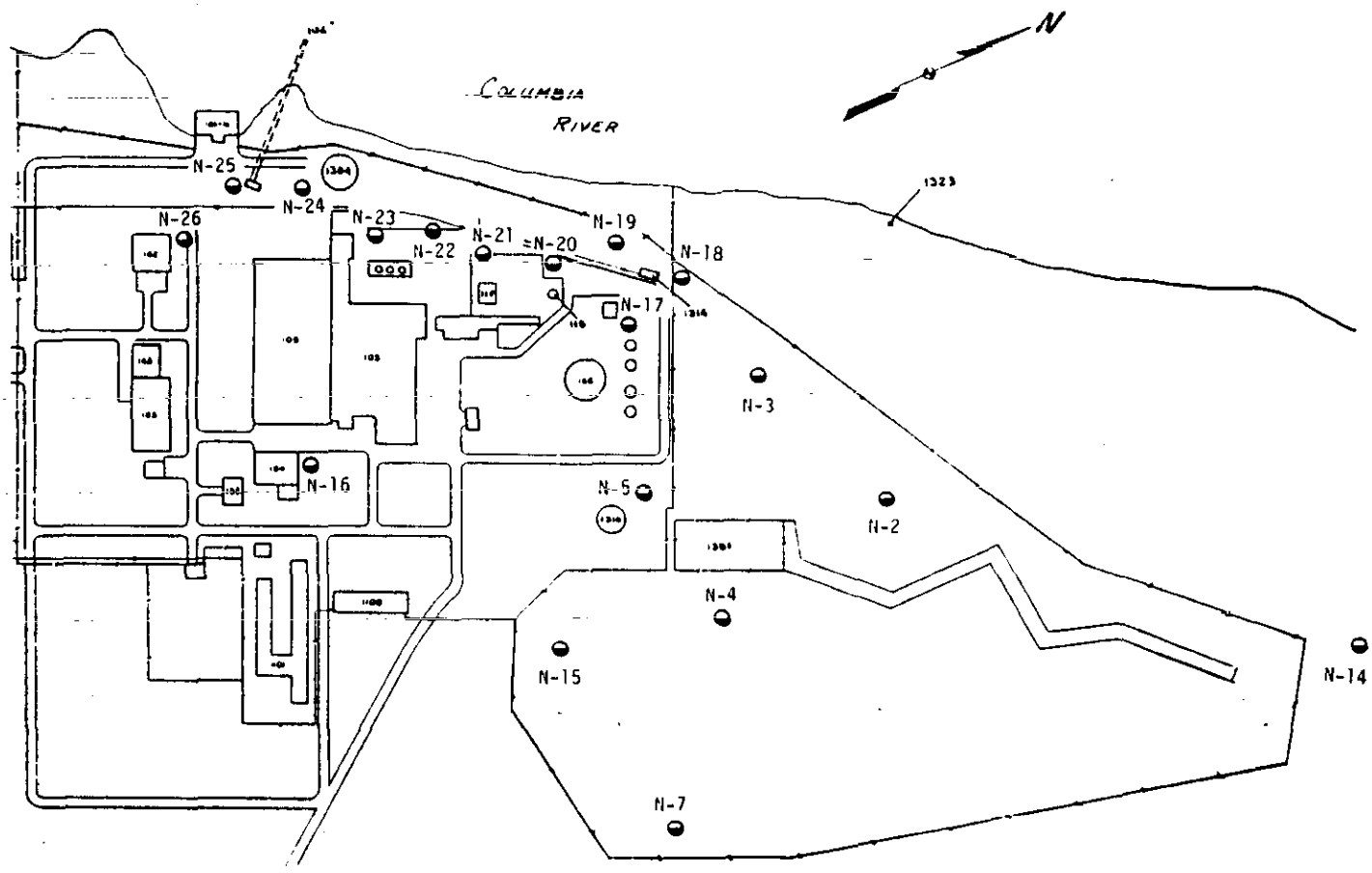

Figure 3.1. Location of Groundwater Monitoring Wells at 100-N Area.

Figure 3.2. Location of Groundwater Monitoring Wells at 100-K Area.

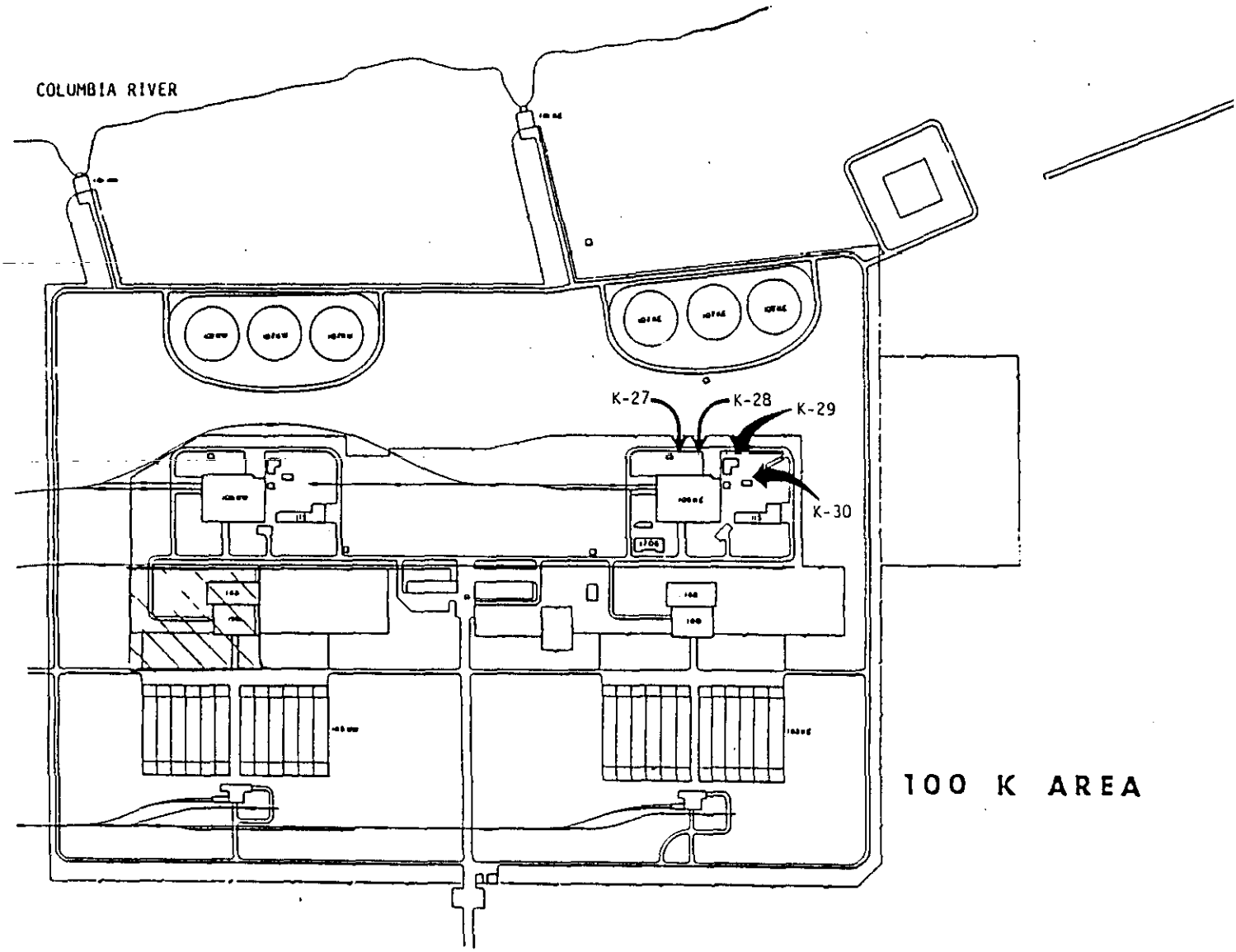

Table 3.1. Radionuclide Concentrations Detected in Groundwater Samples Collected at 100-N and 100-K Areas. Concentrations are in pCi/L.

Well Number	Cobalt-60		Ruthenium-106		Antimony-125	
	Avg.	Max.	Avg.	Max.	Avg.	Max.
N-2	96	110	ND	ND	53	63
N-3	38	45	75	75	33	40
N-4	43	53	74	74	7.8	8.5
N-5	94	190	240	240	31	72
N-6	78	145	78	78	28	36
N-7	30	32	ND	ND	ND	ND
N-14	120	180	79	110	40	56
N-15	47	65	ND	ND	7.0	7.0
N-16	9.3	12	ND	ND	ND	ND
N-17	30	46	75	75	ND	ND
N-18	12	12	ND	ND	ND	ND
N-19	26	36	ND	ND	ND	ND
N-20	21	29	8.5	8.5	ND	ND
N-21	13	17	ND	ND	ND	ND
N-22	10	10	ND	ND	ND	ND
N-23	12	14	ND	ND	ND	ND
N-24	16	16	ND	ND	ND	ND
N-25	11	11	ND	ND	ND	ND
N-26	16	16	ND	ND	ND	ND
K-27	14	15	110	210	100	200
K-28	15	15	22	22	ND	ND
K-29	24	24	ND	ND	ND	ND
K-30	ND	ND	ND	ND	ND	ND

ND = Not detected.
Average values based on detectable results.
In addition to the above radionuclides, Ruthenium-103 and Iodine-131 were found in the following samples:

Well Number	Ru-103		I-131	
	Avg.	Max.	Avg.	Max.
N-2	65	100	3100	3100
N-3	18	18	ND	ND
N-14	25	25	260	270

4.0 SOIL SAMPLING

Soil sampling provides a means to evaluate radionuclides which settle out of the air, are absorbed from liquid releases to the soil, or spread due to the burial of radioactive solid waste. Soil samples were collected once during 1982 at each of the 100 Areas. Sample locations are indicated on Figures 4.1 - 4.6. Soil sampling locations were selected to maximize the potential for detecting radionuclides from either airborne deposition, past leakage or disposal of radioactive liquid effluents, or past disposal of radioactive solid waste.

Soil samples consisted of surface soil (top 2.5 cm) collected with a small trowel. Approximately 100 cc of soil was collected at each location. Radionuclide concentrations detected in these soil samples are listed in Table 4.1.

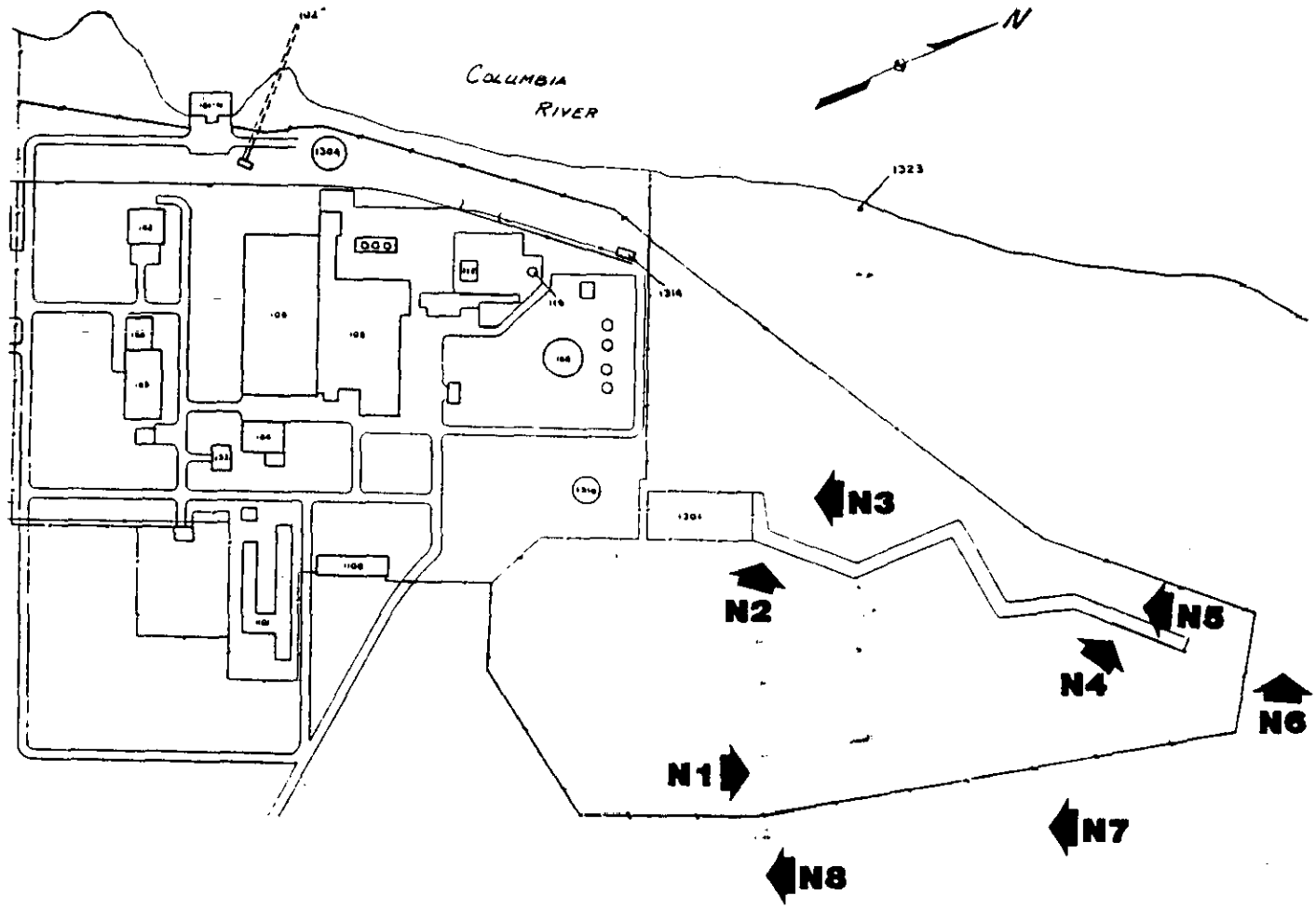

Figure 4.1. Soil and Vegetation Sampling Locations at 100-N Area.

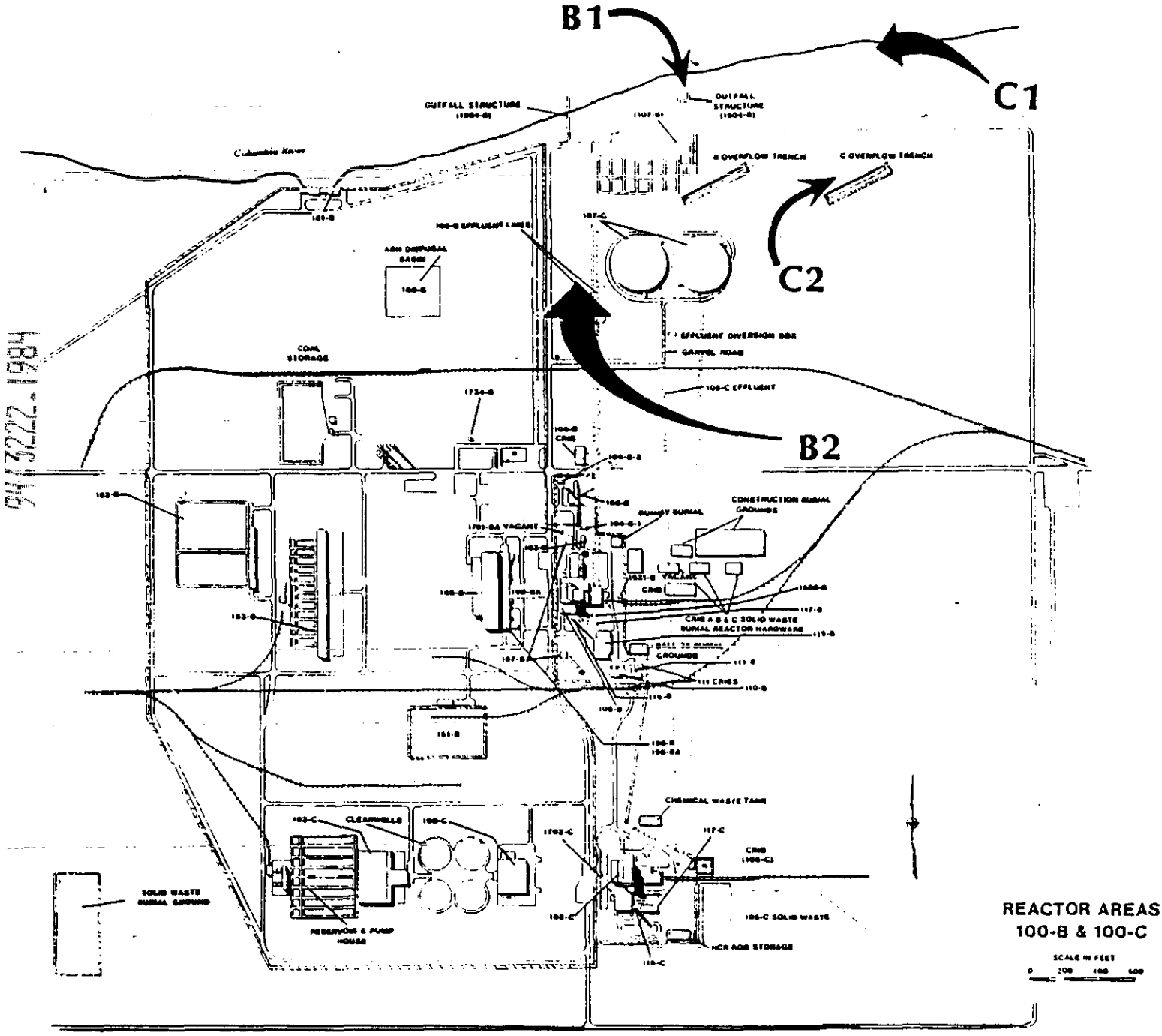

Figure 4.2. Soil and Vegetation Sampling Locations at 100-B/C Area.

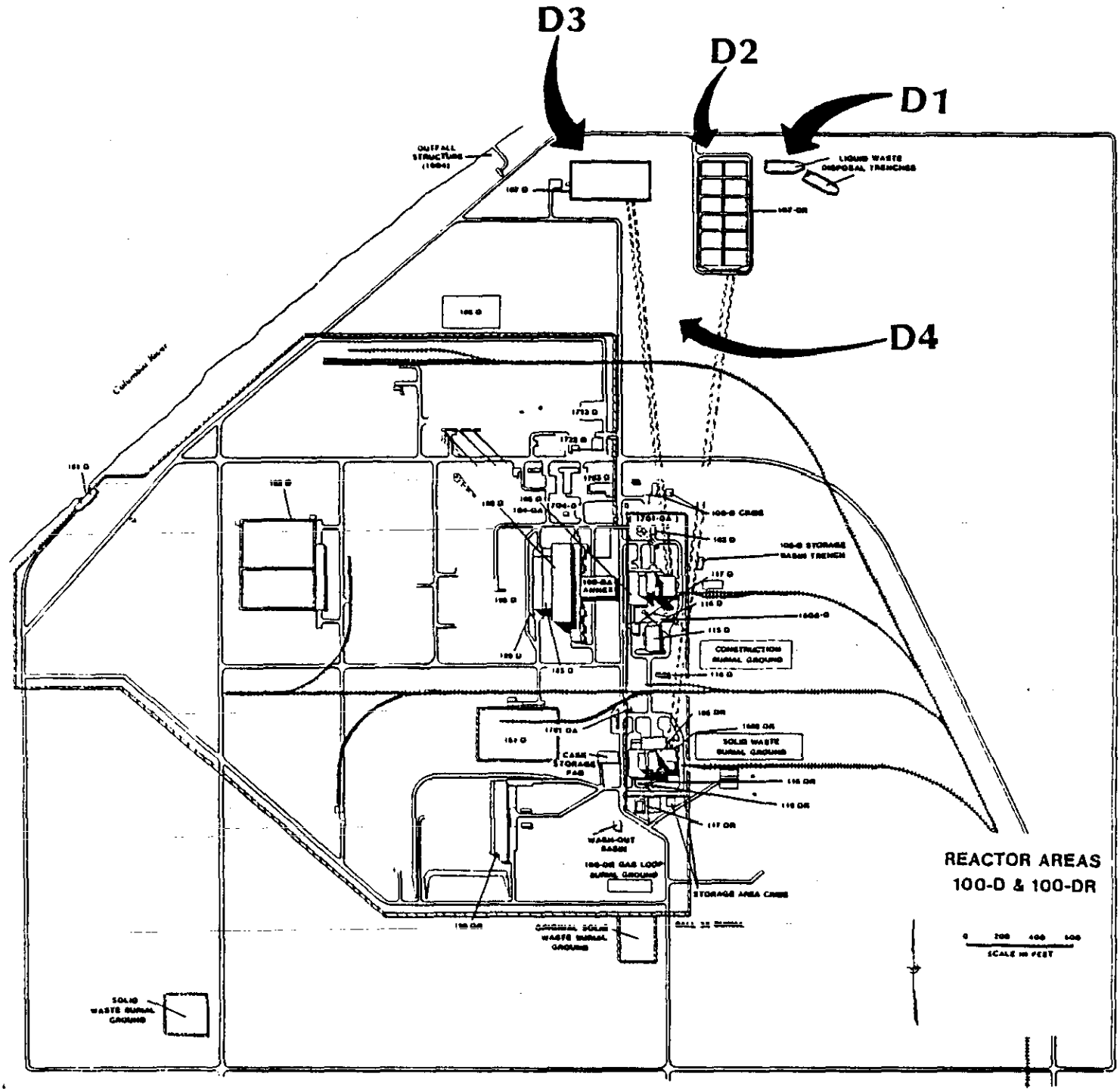

Figure 4.3. Soil and Vegetation Sampling Locations at 100-D/DR Area.

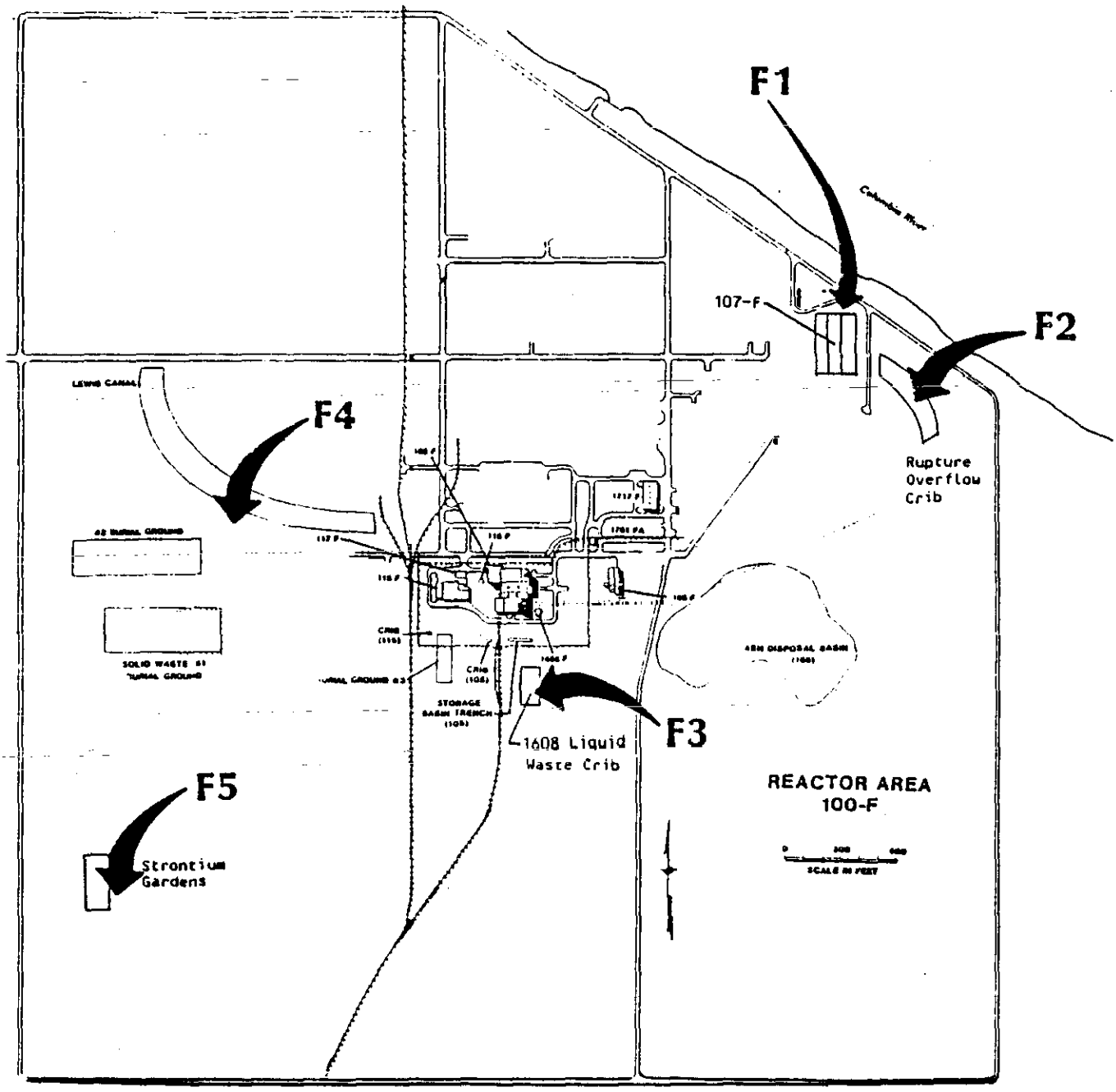

Figure 4.4. Soil and Vegetation Sampling Locations at 100-F Area.

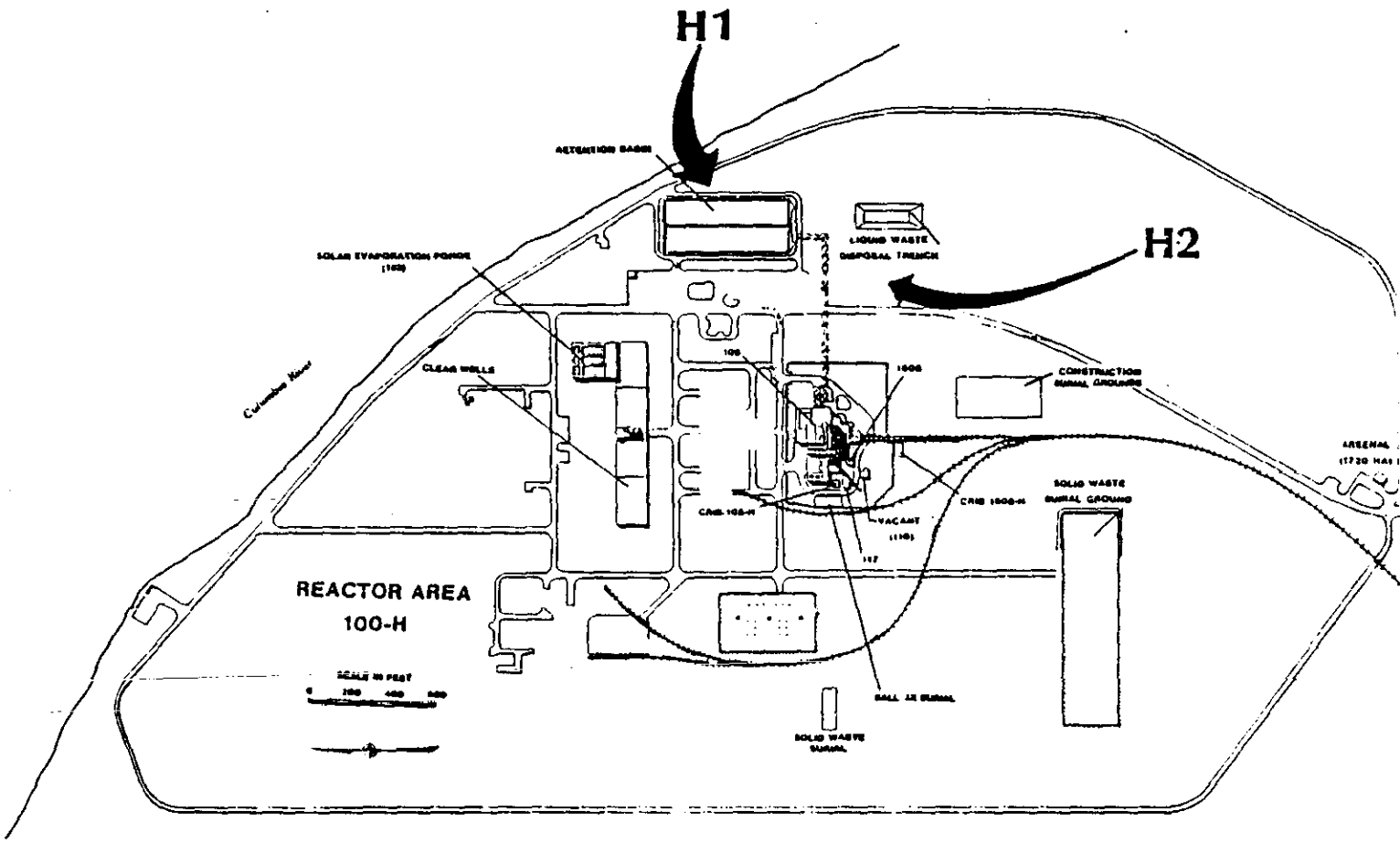

Figure 4.5. Soil and Vegetation Sampling Locations at 100-H Area.

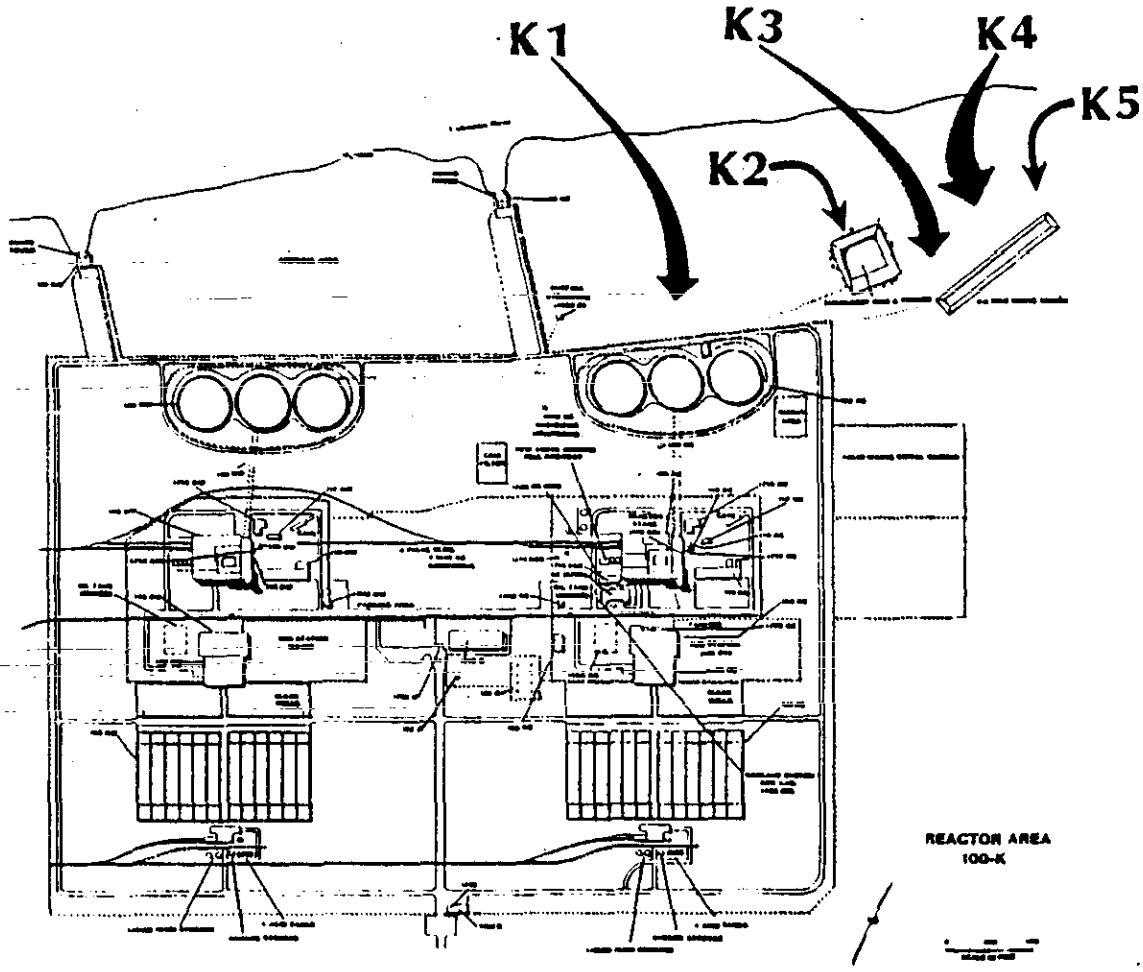

Figure 4.6. Soil and Vegetation Sampling Locations at 100-K Area.

Table 4.1. Radionuclide Concentrations Detected in Soil Samples Collected in the 100 Areas. Concentrations are in pCi/g (dry weight).

Sample Location	Mn-54	Co-60	Cs-137	Eu-152	Eu-155
N1	ND	4.3	0.86	ND	ND
N2	0.68	9.3	4.2	ND	0.36
N3	0.37	6.6	1.3	ND	0.24
N4	1.3	8.0	3.9	ND	ND
N5	0.29	3.2	3.3	ND	ND
N6	0.09	0.56	0.31	ND	0.27
N7	0.17	1.9	0.34	ND	0.14
N8	ND	2.4	0.36	ND	ND
B1	ND	1.2	1.3	3.0	0.54
B2	ND	1.1	1.8	1.3	ND
C1	ND	0.53	0.89	0.78	ND
C2	ND	0.44	ND	ND	ND
D1	ND	ND	0.25	0.24	ND
D2	ND	0.46	0.78	0.79	0.47
D3	ND	0.52	0.16	0.74	0.19
D4	ND	ND	0.08	ND	0.12
F1	ND	4.4	1.7	7.9	0.39
F2	ND	0.44	0.85	1.0	ND
F3	ND	0.70	4.0	0.76	ND
F4	ND	ND	ND	ND	ND
F5	ND	0.16	0.38	ND	0.32
H1	ND	0.15	ND	0.15	ND
H2	ND	0.20	0.34	0.35	0.33
K1	ND	130	2.6	160	4.9
K2	ND	0.45	0.81	ND	ND
K3	ND	0.29	0.43	ND	ND
K4	ND	0.16	0.19	ND	ND
K5	ND	0.51	0.38	0.29	ND

ND = Not Detected

In addition to the radionuclides listed above, Eu-154 was detected at the following sample sites in the following concentrations: 1.2 pCi/g at F3; 1.4 pCi/g at F2; and 0.06 pCi/g at H2.

5.0 TRENCH SEDIMENT SAMPLING

Trench sediment samples were collected once during 1982 at the locations indicated in Figure 5.1. Sediment samples were obtained by attaching a small jar to the end of a long pole and using this device as a scoop. Approximately 25 cc of sediment is collected. Sediment gathered by the scoop is transferred to a 200 mL jar and the scoop is then rinsed with the water in the trench.

Radionuclide concentrations detected in trench sediment samples are listed in Table 5.1. A comparison of the average concentrations of several radionculides found in trench sediment samples over the past several years is included in Table 5.2 and Figure 5.2.

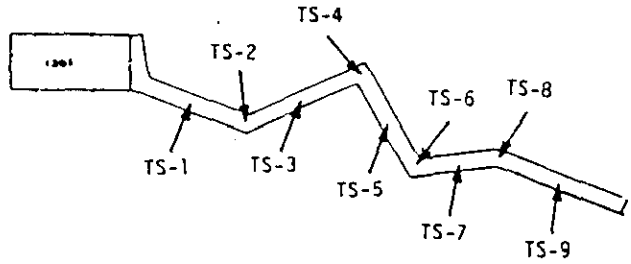

Figure 5.1. Trench Sediment Sampling Locations.

Table 5.1. Radionuclide Concentrations Detected in 1301-N Trench Sediment Samples. Concentrations are in pCi/g (dry weight).

Sample Location	Mn-54	Co-60	Cs-137
TS-1	7.1×10^5	2.1×10^7	9.4×10^5
TS-2	1.9×10^6	2.7×10^7	4.9×10^5
TS-3	8.6×10^5	3.4×10^7	9.4×10^5
TS-4	4.6×10^5	6.4×10^6	5.3×10^5
TS-5	4.6×10^5	6.6×10^6	5.4×10^5
TS-6	4.7×10^5	1.5×10^7	5.0×10^5
TS-7	4.9×10^5	1.4×10^7	1.0×10^6
TS-8	2.7×10^5	4.5×10^6	4.6×10^5
TS-9	ND	4.3×10^6	5.6×10^5
Avg.	7.0×10^5	1.5×10^7	6.6×10^5

In addition to the radionuclides listed above, samples TS-2 and TS-9 contained CePr-144 in concentrations of 2.1×10^6 pCi/g and 1.3×10^6 pCi/g, respectively.

ND = Not Detected

NOTE: Sr-90 and Pu-239/240 analytical results were not available at time of publication. These results will be distributed at a later date.

Table 5.2. Comparison of Average Concentrations (pCi/g - dry wt.) of Selected Radionuclides in 1301-N Trench Sediment Samples Since 1975.

Year	Co-60	Cs-137	Sr-90	Pu-239/240
1975	5.2×10^6	1.1×10^6	2.4×10^3	9.8×10^2
1976	2.0×10^6	1.8×10^5	2.7×10^4	3.7×10^3
1977	7.1×10^5	7.9×10^4	2.1×10^4	4.6×10^3
1978	5.2×10^6	2.2×10^5	2.5×10^4	5.2×10^3
1979	2.6×10^7	8.1×10^5	4.2×10^4	6.2×10^3
1980	6.4×10^6	2.8×10^5	1.1×10^5	4.0×10^4
1981	9.1×10^6	4.5×10^5	1.5×10^5	1.8×10^4
1982	1.5×10^7	6.6×10^5	Not Yet Available	

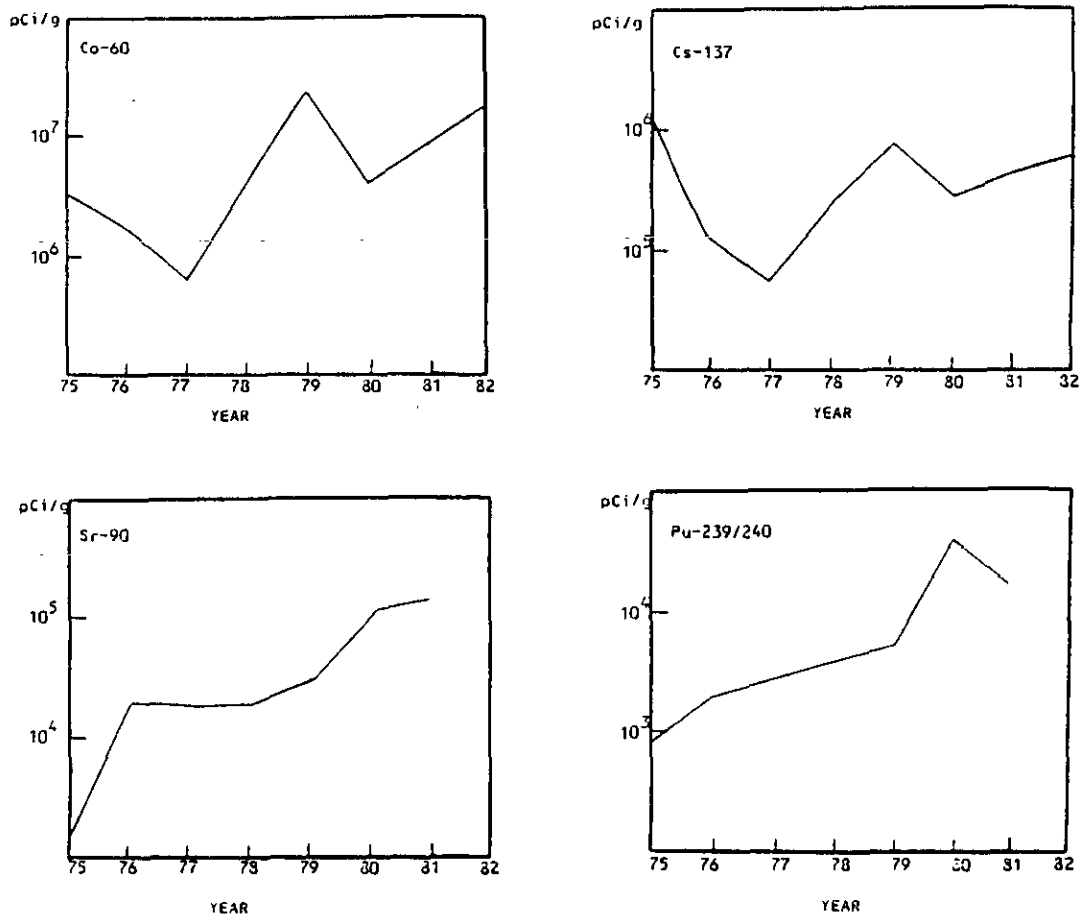

Figure 5.2. Average Concentrations (pCi/g - dry wt.) of Selected Radionuclides in 1301-N Trench Sediment Samples since 1975.

6.0 VEGETATION SAMPLING

Radionuclides can concentrate in plants by surface deposition, root uptake, and translocation from other parts of the plant. Since herbivorous animals in the 100 Areas may utilize potentially contaminated vegetation as a food source, it is important to analyze vegetation samples to assess the potential for biotransport of radionuclides upward through higher trophic levels.

Four vegetation samples were collected along the 1301-N Riverbank Springs in 1982. All vegetation samples in this area consisted of the lush riparian plants common along the shoreline. Each sample was taken from an area where a visible spring was entering the river in an attempt to maximize the potential for detecting radionuclides in the vegetation along the riverbank springs. Sample SV-1 was collected approximately 100 feet upstream of the 1323-N sample building and sample SV-4 was collected about 200 feet downstream of 1323-N. The other samples were collected between these two sample locations. Concentrations of radionuclides detected in the 1301-N Riverbank springs vegetation samples are presented in Table 6.1.

Other vegetation samples were collected once during 1982 in all of the 100 Areas at the same locations as the soil samples (refer to Figures 4.1 - 4.6). Vegetation sampling locations were selected to maximize the potential for detecting radionuclides in the vegetation from either airborne deposition or root uptake of underground radioactive liquid. Vegetation samples consisted of the growing parts of the plants (except cheatgrass) that were dominant at a particular location. Whenever possible, perennial shrubs were collected in order to compare as closely as possible to the PNL Environmental Surveillance Program. Concentrations of radionuclides detected in the vegetation samples are listed in Table 6.2.

Table 6.1. Concentration of Radionuclides Detected in 1301-N Riverbank Springs Vegetation Samples. Concentrations are in pCi/g.

Sample Location	Mn-54	Co-60	Ru-103	Ru-106	Sb-125	I-131
SV-1	ND	2.0	ND	ND	0.16	ND
SV-2	0.12	5.7	0.26	1.5	0.43	0.66
SV-3	ND	1.5	ND	ND	0.23	0.36
SV-4	0.17	1.8	0.12	ND	0.19	0.42

ND = Not Detected

Table 6.2. Concentrations of Radionuclides Detected in 100 Area Vegetation Samples. Concentrations are in pCi/g (dry weight).

Sample Location	Mn-54	Co-60	Cs-137
N1	0.82	2.6	0.09
N2	0.92	3.4	0.21
N3	0.17	0.81	0.44
N4	0.31	0.98	0.44
N5	0.06	0.28	0.10
N6	0.46	1.8	0.13
N7	0.16	0.48	ND
N8	0.85	2.1	ND
B1	ND	0.23	0.20
B2	ND	0.12	0.06
C1	ND	0.21	0.13
C2	ND	ND	0.04
D1	ND	ND	ND
D2	ND	0.11	2.7
D3	ND	ND	ND
D4	ND	ND	ND
F1	ND	0.10	0.08
F2	ND	0.07	0.06
F3	0.10	0.46	3.7
F4	ND	0.07	0.04
F5	ND	0.12	0.07
H1	ND	ND	ND
H2	ND	ND	ND
K1	ND	0.17	0.05
K2	ND	0.09	0.07
K3	ND	0.14	ND
K4	ND	0.56	2.8
K5	ND	ND	ND

ND = Not Detected

In addition to the radionuclides listed above, 2.4 pCi/g of Nb-95 was detected in sample N1, 0.07 pCi/g of Eu-154 was detected in sample K1, 0.06 pCi/g of Eu-155 was detected in sample F4, and 17 pCi/g of Ru-103 was detected in sample N3.

7.0 DIRECT RADIATION MEASUREMENT

7.1 1301-N Grid Survey

A grid network of radiation survey locations is established adjacent to the 1301-N crib and trench (Figure 7.1). Surveys were taken at intersecting points of the grid shown in the figure below. A direct reading count rate integrating instrument (an Eberline HP-210 probe with an Eberline Scaler) was used to measure activity and a μR meter (Ludlum Model 12S) is used to measure the dose rate at each location. Data collected is presented in Table 7.1.

Measurements were made at a height of one metre. To obtain an activity count rate per minute, counts were made for two minutes and averaged. Direct radiation surveys of the 1301-N grid are performed annually. This survey was performed on June 27, 1982. At this time, N Reactor was shut down for the summer maintenance outage and the crib flow rate was approximately 1900 gpm. There was no internal decontamination of reactor piping during 1982, so there were no decontamination wastes in the 1310-N or 1314-N waste tanks.

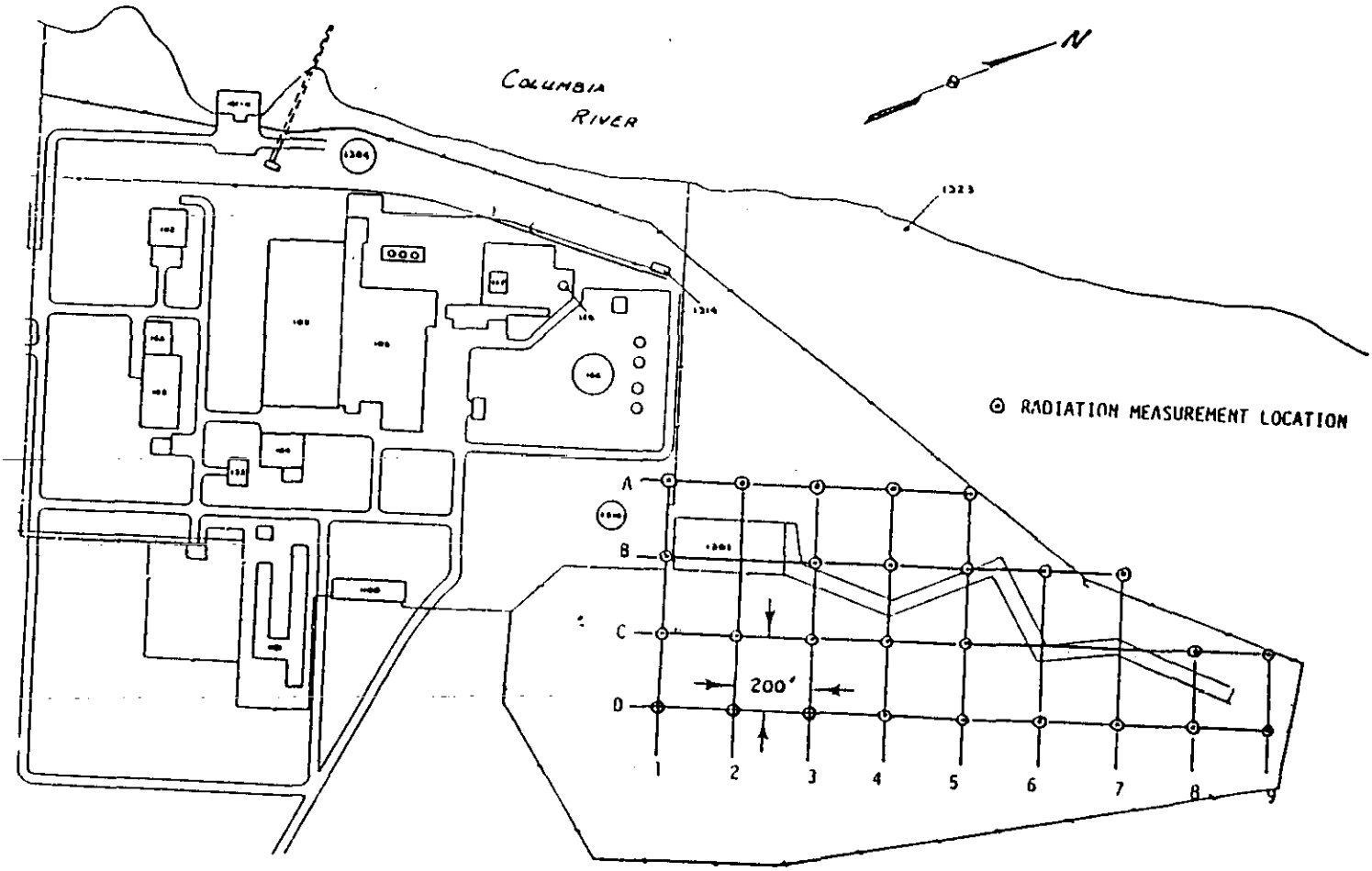

Figure 7.1. Grid Used for Radiation Survey Around the 1301-N Facility.

Table 7.1. Data from 1301-N Grid Survey in Counts per Minute and μR per hour.

Grid Point	CPM	μR/hr
A1	380	900
A2	205	550
A3	200	260
A4	90	150
A5	105	120
B1	11,000	off scale
B3	305	700
B4	120	240
B5	120	270
B6	95	150
B7	100	110
C1	740	750
C2	410	550
C3	280	400
C4	170	280
C5	140	200
C8	140	200
C9	90	80
D1	250	230
D2	170	160
D3	130	160
D4	90	130
D5	160	120
D6	150	130
D7	100	120
D8	110	100
D9	90	100

7.2 Environmental Dosimeters

External radiation dose information is collected at 100-N Area using CaF_2:Mn (TLD-400) thermoluminescent dosimeters. The dosimeters used are delivered and picked up monthly by PNL where they are read, calibrated, and annealed.

Locations of the environmental dosimeters at 100-N Area are depicted in Figure 7.2. This drawing also shows the area of river shoreline that was surveyed in the annual shoreline survey.

The data collected from the 100-N Area environmental dosimeters are presented in Table 7.2. Included is the average dose rate, continuous occupancy dose, and the dose to workers. The dose to workers is defined as the dose to a person that spends 40 hours per week and 52 weeks per year at the site of a specific environmental dosimeter.

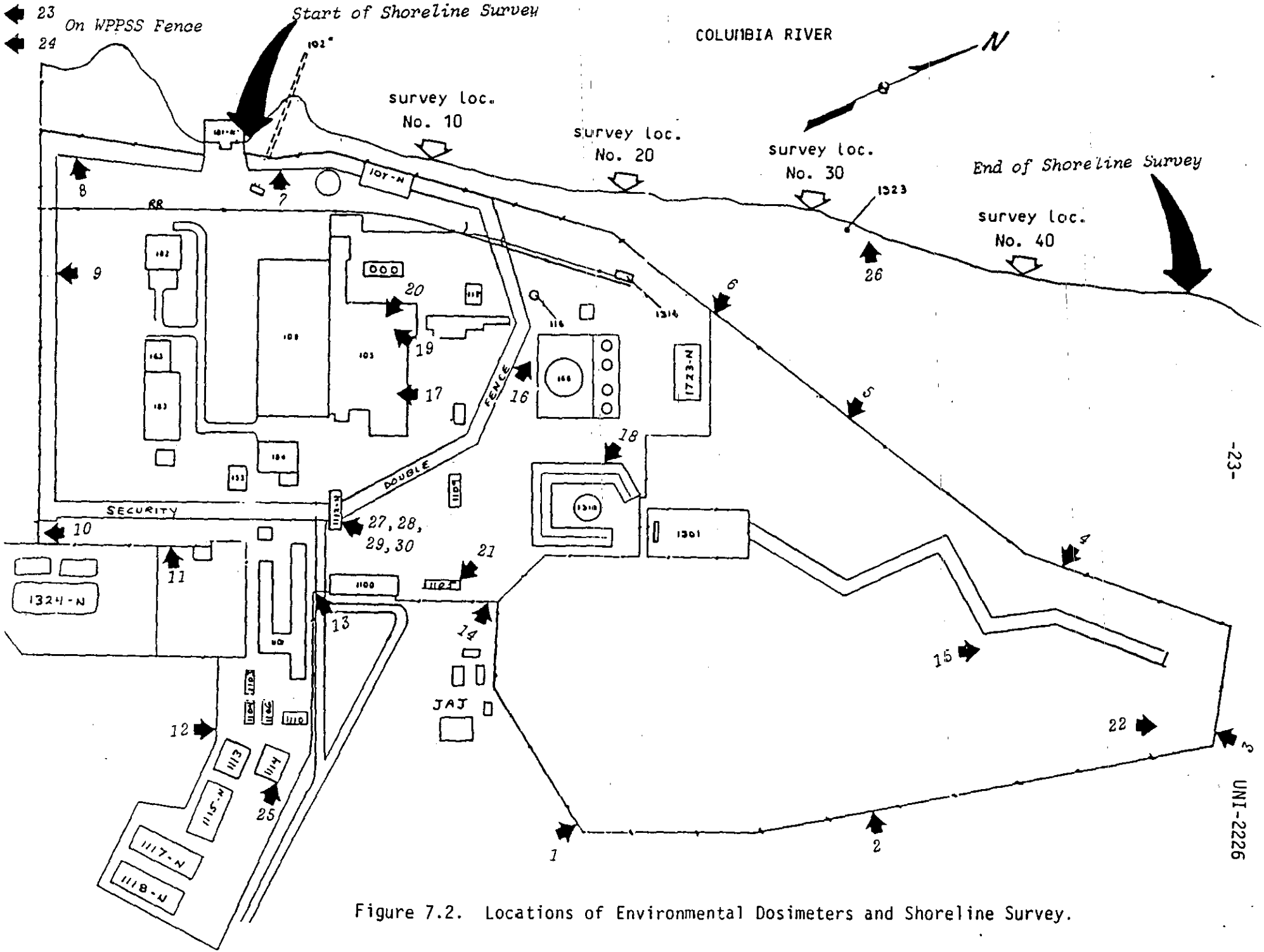

Figure 7.2. Locations of Environmental Dosimeters and Shoreline Survey.

Table 7.2. Dose Rates (mrad/hr) Detected from 100-N Area Environmental Dosimeters.

ENVIRONMENTAL TLD READINGS FISCAL YEAR 1982

AUGUST 1981 - AUGUST 1982

TLD LOCATION ON	TLD LOCATION OFF	PER.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
08/28/81	09/25/81	1	.039	.044	.028	.084	.064	.061	.159	.014	.012	.014	.016	.016	.035	.081	.400	.096	.008	.103	.006	.006	.087	.062	.008	.006	.011	.022	NOT	INSTALLED		YET
09/25/81	10/23/81	2	.027	.043	.032	.077	.052	.056	.160	.008	.008	.009	.009	.010	.023	.065	.564	.083	.005	.087	.006	.007	.073	.091	.006	.005	.006	.016	.011	.008	.010	.014
10/23/81	11/20/81	3	.029	.041	.033	.097	.056	.051	.143	.009	.008	.009	.010	.011	.024	.061	.544	.067	.006	.084	.005	.006	.070	.083	.007	.005	.007	.021	.012	.010	.012	.016
11/20/81	12/18/81	4	.025	.033	.026	.075	.046	.047	.132	.013	.033	.009	.011	.011	.025	.060	.294	.083	.006	.088	.006	.024	.071	.057	.007	.005	.007	.015	.013	.008	.012	.014
12/18/81	01/20/82	5	.025	.031	.018	.035	.042	.044	.107	.009	.008	.009	.010	.010	.021	.063	.028	.067	.006	.076	.005	.005	.067	.018	.006	.004	.007	.016	.012	.007	.011	.014
01/20/82	02/12/82	6	.023	.021	.011	.023	.034	.037	.128	.009	.009	.009	.009	.009	.022	.054	.016	.063	.006	.076	.005	.005	.078	.012	.006	.005	.006	.011	.012	.007	.009	.014
02/12/82	03/12/82	7	.026	.024	.019	.026	.039	.041	.119	.009	.009	.009	.011	.012	.025	.066	.019	.076	.006	.085	.006	.009	.071	.016	.007	.005	.008	.017	.013	.008	.013	.014
03/12/82	04/09/82	8	.024	.021	.014	.024	.035	.039	.118	.009	.008	.008	.009	.009	.023	.064	.019	.065	.006	.077	.006	.007	.064	.014	.006	.004	.006	.014	.012	.008	.012	.016
04/09/82	05/07/82	9	.022	.021	.013	.028	.035	.036	.130	.008	.008	.009	.008	.008	.020	.057	.019	.066	.006	.069	.005	.006	.060	.013	.005	.004	.005	.012	.011	.006	.010	.013
05/07/82	06/04/82	10	.020	.020	.013	.033	.033	.033	.133	.006	.007	.006	.007	.007	.018	.054	.021	.063	.004	.066	.005	.006	.060	.015	.005	.004	.004	.009	.011	.006	.011	.015
06/04/82	07/01/82	11	.022	.020	.013	.025	.030	.034	.222	.009	.008	.008	.008	.008	.020	.061	.017	.063	.005	.076	.007	.007	.063	.012	.006	.005	.005	.008	.011	.006	.016	.016
07/01/82	07/29/82	12	.018	.015	.012	.027	.026	.034	.122	.008	.007	.006	.007	.007	.018	.054	.017	.062	.006	.063	.005	.006	.063	.014	.006	.005	.005	.009	.011	.007	.013	.013
07/29/82	08/26/82	13	.025	.021	.013	.025	.037	.044	.106	.013	.019	.011	.013	.013	.026	.065	.018	.075	.006	.081	.005	.006	.069	.014	.009	.005	.008	.012	.014	.008	.016	.018
Average Dose Rate (mRad/hr)			.025	.028	.019	.044	.041	.043	.137	.009	.011	.009	.010	.010	.023	.062	.152	.071	.006	.079	.006	.008	.069	.032	.006	.005	.007	.014	.012	.007	.012	.015
Continuous Occupancy Dose, mRad/yr			220	240	170	380	360	376	1200	79	96	79	87	87	200	540	1300	620	52	690	52	70	600	280	52	44	61	120	100	61	100	130
Dose Rate to Workers mRad/yr			52	58	40	92	85	89	280	19	23	19	21	21	48	130	320	150	13	160	13	17	140	67	13	10	15	29	25	15	25	31

7.3 Shoreline Survey

An Eberline HP-210 probe with an Eberline Scaler and a Ludlum Model 12S μR meter were used to conduct the annual Columbia River shoreline radiation survey which began just downstream of the 181-N building and ended approximately 1000 feet downstream from the 1323-N sample shed. The measurements were made approximately every 50 feet along the high water mark of shoreline and were taken one metre above ground and in the same manner as the 1301-N Grid Survey. Data collected during the shoreline survey is presented in Table 7.3.

The shoreline survey is performed annually. This survey was conducted on June 27, 1982. At that time the reactor was shut down for the summer maintenance outage. There were no internal decontamination wastes in the 1310-N or 1314-N waste tanks at the time of the survey and the crib flow rate was approximately 1900 gpm.

During the survey the river elevation was relatively high with a river flow rate of 212,000 cfs. The Emergency Dump Tank, which is normally about 75% full, was empty during this time for maintenance work. This may account for higher dose rates and activity levels near the dump tank. The dose rates and activity levels detected during the shoreline survey are plotted in Figure 7.3.

Additional dose rate readings were taken along the shoreline below the Emergency Dump Tank after the tank was returned to normal status. At that time the dose rates were much lower than those detected in June 1982. Of five readings taken, the maximum dose rate was 100 μR/hr and the average dose rate was 85 μR/hr.

Table 7.3 Radiation Data from the 100-N Area Shoreline Survey in Counts per Minute and μR per Hour.

Location	CPM	μR/hr	Location	CPM	μR/hr
1	105	190	26	70	70
2	130	240	27	85	60
3	130	200	28	65	60
4	200	500	29	55	50
5	150	300	30	70	40
6	130	300	31	80	40
7	95	200	32	60	35
8	85	150	33	60	35
9	75	200	34	65	40
10	75	110	35	45	35
11	75	100	36	80	30
12	110	100	37	60	30
13	70	80	38	70	30
14	60	80	39	80	25
15	75	90	40	60	20
16	60	90	41	50	25
17	70	100	42	65	20
18	90	100	43	95	25
19	90	120	44	80	20
20	105	125	45	65	20
21	90	125	46	55	20
22	75	120	47	50	20
23	70	100	48	70	20
24	70	80	49	60	15
25	80	80	50	75	15

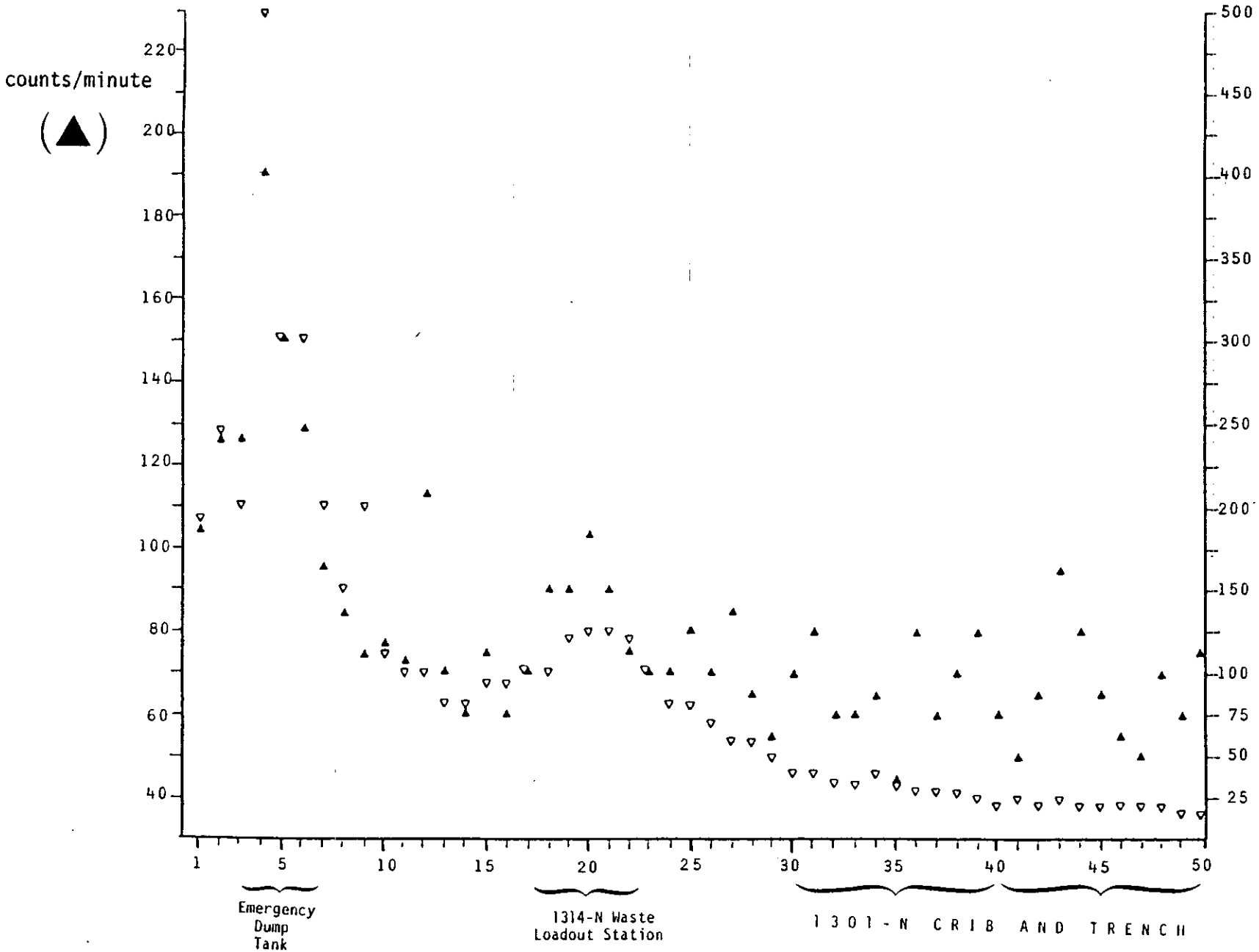

Figure 7.3. Dose Rates and Activity Levels Detected During the Shoreline Survey.

8.0 SPECIAL ENVIRONMENTAL SAMPLES

As part of the Environmental Surveillance Program for the 100 Areas, the results of special environmental samples or studies of the 100 Area environs is included in the annual surveillance report. These special samples are listed in the following subsections.

8.1 Radioanalysis of Deer Mice Collected Around the 1301-N Facility

As part of a continuing program to assess the biotransport of radionuclides in the 100 Areas, deer mice (Peromyscus maniculatus) were collected around the 1301-N Trench for analysis of gamma-emitting radionuclides and strontium-90. Thirty snap traps were set along the trench (see Figure 8.1) beginning October 27, 1981 and 18 mice were collected the following three days.

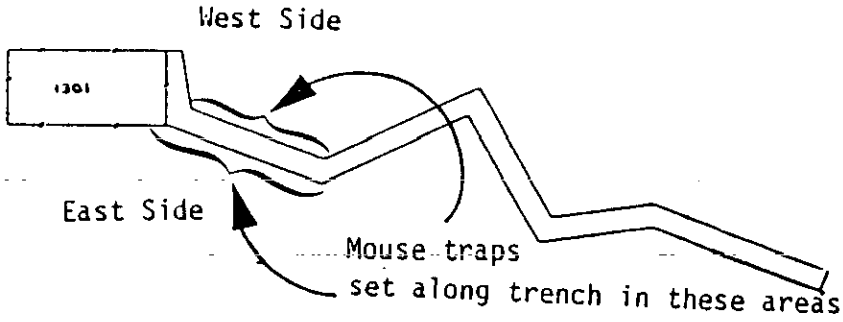

Figure 8.1. Mouse Trap Locations Around 1301-N Facility.

Results of the gamma analysis of these mice are presented in Table 8.1. A wide variety of fission and activation products were detected in the deer mice. Co-60 concentrations ranged from 54 to 17,000 pCi/g (wet wt.) and Cs-137 concentrations ranged from 25 to 26,000 pCi/g (wet wt.). The presence of significant concentrations of short-lived I-131 indicates that the mice are drinking directly from the trench. In addition, the deer mice are probably receiving radionuclides from feeding on the green vegetation growing in or near the trench and feeding on insects that are associated with the trench. It should be mentioned that these mice were collected before the 1301-N Trench Cover was installed. The trench cover is designed to prevent small mammal access to the trench.

The radionuclide concentrations reported in Table 1 are similar to the concentrations PNL has found in mice collected around the trench in previous years. PNL has reported Co-60 concentrations as high as 20,000 pCi/g (wet wt.) for these mice. Since PNL mouse samples were also analyzed as mouse "whole body" rather than specific tissues, there is a good comparison between the mice recently collected and the mice colleted by PNL in the past.

Table 8.1. Concentrations of Gamma-Emitting Radionuclides Detected in Deer Mice Collected Around the 1301-N Trench. Concentrations are in pCi/g (wet wt.).

Deer Mouse Number	Cr-51	Mn-54	Co-58	Fe-59	Co-60	Nb-95	Zr-95	Ru-103	Sb-124	I-131	Cs-134	Cs-137	La-140	Ce-144	Eu-154
1	ND	63	12	130	260	ND	ND	ND	ND	58	8.6	78	84	ND	ND
2	74	240	23	440	570	41	42	ND	8.0	39	17	110	140	130	5.9
3	150	510	71	960	1,700	130	110	ND	8.0	340	75	410	ND	130	24
4	ND	32	ND	110	260	ND	ND	ND	ND	390	15	190	ND	ND	ND
5	ND	90	ND	150	340	20	25	ND	8.0	ND	5.9	71	83	44	11
6	470	2,600	250	2,600	11,000	460	430	51	ND	350	230	2,300	84	1,600	ND
7	ND	18	ND	31	54	ND	ND	ND	ND	22	4.8	52	7.1	ND	ND
8	ND	12	ND	21	60	ND	ND	ND	ND	8.4	ND	25	2.1	ND	ND
9	ND	150	18	280	480	23	26	ND	11	18	ND	94	120	37	100
10	110	430	41	530	2,700	69	83	23	15	25	33	380	ND	430	29
11	210	630	120	1,300	2,400	180	160	22	ND	320	110	1,200	820	220	41
12	320	1,000	140	1,800	3,300	97	100	20	51	18	120	1,300	120	190	31
13	ND	15	ND	22	55	ND	ND	ND	ND	9.8	3.5	33	31	ND	ND
14	ND	13	ND	24	98	ND	ND	ND	ND	13	7.1	120	ND	ND	ND
15	ND	270	28	380	1,100	33	ND	ND	ND	24	130	1,700	26	100	ND
16	610	4,000	470	4,900	17,000	1,800	1,600	130	140	220	200	2,600	220	3,600	250
17	ND	37	ND	75	190	ND	ND	ND	11	29	ND	110	22	ND	ND
18	81	360	36	490	1,600	42	38	ND	27	19	26	240	29	160	ND
Avg.*	250	580	110	790	2,400	260	260	50	29	110	52	610	130	590	61

ND = Not Detected

In addition to the above, the following radionuclide concentrations were detected: 170 pCi/g of Zn-65, 600 pCi/g of Ru-106, and 5,300 pCi/g of I-132 in deer mouse #6; 180 pCi/g of Ru-106 and 18 pCi/g of Ce-141 in deer mouse #10; 21 pCi/g of Ce-141 in deer mouse #11; 56 pCi/g of Zn-65 in deer mouse #12; and 220 pCi/g of Zn-65, 1,200 pCi/g of Ru-106, and 69 pCi/g of Ce-141 in deer mouse #16.

*Average based on detectable results only.

Total gamma activity ranged from about 3,200 pCi in deer mouse #8 (mouse weight = 25.0 grams) to nearly one micro-Curie in deer mouse #16 (mouse weight = 23.0 grams).

The 18 mice collected were grouped into four composite samples and delivered to U.S. Testing for Sr-90 analysis. The composite samples were grouped according to similar Cs-137 concentrations as follows:

Composite Sample	Deer Mouse Numbers
A	6, 11, 12, 15, 16
B	3, 4, 10, 18
C	2, 9, 14, 17
D	1, 5, 7, 8, 13

The Sr-90 concentrations detected in the composite samples of deer mice are presented in the following table.

Table 8.2. Sr-90 and Cs-137 concentrations in deer mice.

Composite Sample	Sr-90 (pCi/g)	Average Cs-137 (pCi/g)
A	190	1,800
B	45	310
C	63	110
D	43	52

As can be seen, the composite sample with the significantly higher average Cs-137 concentration also contained a significantly higher concentration of Sr-90.

Concentrations of Sr-90 were lower than most of the concentrations of gamma-emitting radionuclides detected in the mice. Based on the effluents discharged to the crib and the concentrations of radionuclides detected in trench sediment samples, one would expect Sr-90 concentrations to be lower than many other radionuclide concentrations. This point is illustrated in Table 8.3 and Section 5.0 of this report, where the trench sediment sampling results are presented.

Table 8.3. Annual Release of Selected Radionuclides in the Effluent Discharged to the 1301-N Crib. (Ci).

Year	Mn-54	Fe-59	Co-60	Sr-90	Cs-137
1981	2.4×10^{2}	1.6×10^{2}	3.7×10^{2}	8.4×10^{1}	2.4×10^{2}
1980	8.1×10^{2}	7.4×10^{2}	1.2×10^{2}	1.6×10^{2}	3.6×10^{2}
1979	6.3×10^{2}	6.4×10^{2}	7.7×20^{2}	1.3×10^{2}	2.9×10^{2}
1978	8.1×10^{2}	7.6×10^{2}	9.4×10^{2}	1.2×10^{2}	3.4×10^{2}
1977	7.8×10^{2}	5.1×10^{2}	8.7×10^{2}	1.2×10^{2}	3.8×10^{2}
Avg.	6.5×10^{2}	5.6×10^{2}	8.3×10^{2}	1.2×10^{2}	3.2×10^{2}

8.2 Strontium and Plutonium Concentrations in 100 Area Soil and Vegetation Samples

Soil and vegetation samples collected over the past two years for the Environmental Surveillance Program have been analyzed for Sr-90, Pu-238, and/or Pu-239/240 concentrations. Due to a slow turn around time at the U.S. Testing Company, these results were not included in the past two annual environmental surveillance reports. The following tables present the strontium and plutonium concentrations that have been detected.

The 100-N Area soil sampling locations in 1980 were very similar to the 100-N Area sampling locations in 1982. Vegetation and soil sampling locations were also the same in 1981 and 1982 so that sampling locations are pictured in Figures 4.1 through 4.6 of this report.

Table 8.4. Sr-90, Pu-238, and Pu-239/240 Concentrations Detected in 100-N Area Soil Samples Collected in 1980. Concentrations are in pCi/g (dry wt.).

Sample	Sr-90	Pu-238	Pu-239/240
T-1	1.2E-1	1.5E-2	1.1E-2
T-2	4.7E-1	2.8E-3	4.3E-2
T-3	7.3E-1	1.3E-2	5.6E-3
T-4	2.2E-1	2.1E-2	4.1E-2
T-5	2.2E-1	2.6E-3	2.5E-2
T-6	1.7E-1	8.4E-3	6.4E-3
T-7	2.0E-1	6.6E-3	2.3E-2
T-8	2.0E-1	8.0E-2	1.9E-2
T-9	1.5E-1	1.2E-2	2.4E-2

Table 8.5. Sr-90 and Pu-239/240 Concentrations Detected in 100 Area Vegetation Samples Collected in 1981. Concentrations are in pCi/g (dry wt.).

Sample	Sr-90	Pu-239/240
V-N1A	3.7E-1	1.4E-2
V-N2A	1.2E0	*
V-N2P	1.7E0	*
V-N3	1.5E0	1.8E-3
V-N4	4.2E-1	*
V-N5	5.4E0	5.4E-3
V-N6	8.4E-1	1.4E-2
V-N7	3.7E-1	*
V-N8A	*	3.6E-2
V-N8P	5.4E-1	1.4E-2
V-B1	3.3E-1	2.6E-2
V-B2	5.2E-2	*
V-C1	3.1E0	1.3E-2
V-C2	6.1E-2	2.0E-3
V-D1	4.8E-1	*
V-D2	1.1E-1	1.0E-2
V-D3	2.9E-1	5.6E-3
V-D4	4.3E-1	2.1E-2
V-F1	*	*
V-F2**	9.2E-1 (8.8E-1; 5.7E0)	1.2E-2 (2.8E-3)
V-F3	1.3E1	5.9E-3
V-F4	2.1E-1	5.4E-3
V-F5	*	3.8E-4
V-H1	2.1E-1	7.4E-5
V-H2	2.6E-1	4.4E-2
V-K1	3.6E0	*
V-K2	2.3E0	1.1E-2
V-K3	6.8E-1	4.0E-3
V-K4**	3.4E-1	2.0E-3 (5.4E-3)
V-K5	9.8E-1	3.4E-2

*Not Reported
**Multiple reportings

Table 8.6. Sr-90 and Pu-239/240 Concentrations Detected in 100 Area Soil Samples Collected in 1981. Concentrations are in pCi/g (dry wt.).

Sample	Sr-90	Pu-239/240
S-N1	5.6E-2	7.1E-3
S-N2	1.9E0	1.7E-1
S-N3	9.9E-1	3.4E-2
S-N4	1.8E-1	4.7E-3
S-N5	3.8E-1	5.7E-3
S-N6	3.9E-1	2.3E-2
S-N7	1.1E-1	6.4E-3
S-N8	1.2E-1	4.1E-3
S-B1	2.1E-1	2.7E-2
S-B2	2.8E-1	3.6E-2
S-C1	1.9E0	1.1E-1
S-C2	2.4E-1	2.7E-2
S-D1	*	*
S-D2	*	*
S-D3	4.6E-2	2.7E-2
S-D4	6.1E-2	5.3E-3
S-F1	2.9E-1	5.0E-3
S-F2	2.2E-1	8.0E-3
S-F3	5.0E-1	1.0E-2
S-F4	4.5E-2	4.4E-2
S-F5	2.9E-1	2.0E-3
S-H1	1.3E-1	2.0E-3
S-H2	3.8E-2	3.8E-3
S-K1	1.5E-1	9.4E-3
S-K2	2.1E-1	5.2E-2
S-K3	1.8E-1	1.7E-2
S-K4	6.6E-2	3.4E-3
S-K5	2.2E-1	3.5E-3

*Not Reported

Table 8.7. Sr-90 and Pu-239/240 Concentrations in Trench Vegetation Collected in 1981. Concentrations are in pCi/g (dry wt.).

Sample	Sr-90	Pu-239/240
TV-1	1.3×10^{3}	3.2×10^{-1}
TV-2	3.1×10^{1}	9.6×10^{-2}
TV-3	1.1×10^{3}	5.2×10^{-2}
TV-4	4.9×10^{2}	5.4×10^{-2}

Table 8.8. Sr-90 and Pu-239/240 Concentrations in Riverbank Springs Vegetation Collected in 1981. Concentrations are in pCi/g (dry wt.).

Sample	Sr-90	Pu-239/240
SV-1	1.2×10^{2}	Not Reported
SV-2	5.9×10^{2}	Not Reported
SV-3	6.7×10^{1}	1.1×10^{-3}
SV-4	3.6×10^{1}	6.3×10^{-3}

Compared to other vegetation samples collected in the 100 Areas, the Sr-90 concentrations in the springs vegetation look a little high. This was the first time the springs vegetation was analyzed for Sr-90 so there is nothing to compare with, however, the Sr-90 numbers appear to be accurate based on the following comparison with Co-60 concentrations in springs water and vegetation:

- in 1981, the total release of Sr-90 at the springs was approximately seven times higher than Co-60,
- in 1981, the average concentration of Sr-90 at the springs was also about seven times higher than Co-60,
- the physical half-life of Sr-90 is about six times longer than Co-60,
- the concentration factor for plant uptake to the edible part of the plant from soil for Sr-90 is about 20 times higher than the concentration factor for Co-60 (C. F. for Sr = 0.2 and C .F. for Co = 0.0094; source - ERDA-1538, pg. III-A-52

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APPENDIX A

ENVIRONMENTAL SURVEILLANCE PROGRAM

SAMPLE COLLECTION AND PREPARATION PROCEDURES

The following procedures are to be used for collecting and preparing the samples required in the UNC Environmental Surveillance Program. There are several different types of samples collected, including:

1) Cartridges from the Continuous Air Monitors,
2) Groundwater Samples,
3) Soil Samples,
4) Trench Sediment Samples,
5) Vegetation Samples,
6) TLDs, and
7) Direct Gamma Surveys.

Battelle Pacific Northwest Laboratories (PNL) is responsible for the environmental surveillance program for the Hanford Site. It is UNC policy to mimic the PNL sample collecton, preparation, and analytical procedures as much as possible to allow maximum comparison of the analytical results between the two surveillance programs.

Site maps showing the sample collection locations are presented directly after the narrative portion which describes the methods for sample collection and preparation.

AIRBORNE CARTRIDGE SAMPLES

Four continuous air sampling stations are set up to monitor 100-N Area. Each sampling station consists of a continuous duty, low volume air pump and a sample cartridge in a weatherproof enclosure.

The removable quick-disconnect stainless steel sample cartridge contains:

1) One paper filter (42.5 mm diameter),
2) A 1-inch deep charcoal bed (35 g activated charcoal GE 602),
3) A 2-inch deep charcoal bed (70 g charcoal GE 618), and
4) A 1 CFM critical orifice.

Safety: Keep clear of moving parts of pumps. Watch for spiders and snakes. Standard laboratory safety rules.

Special Tools or Equipment: Quick-disconnect stainless steel sample cartridge.

Prerequisites: Continuous air pump must be operating. If pump is not operating, notify Environmental Control.

Sample Collection: Sample cartridges are collected and replaced every four weeks. For guidance on packing the sample cartridges, refer to UNI-M-3, "Radiation Practices Manual," Section 2.7. Be sure samples are labelled correctly.

Sample Type: Airborne cartridge sample (charcoal and particulate).

Sample Preparation: Refer to UNI-M-76 REV 1, Section 2.14.

Sample Volume: The volume for a 28 day sample @ 1 cfm equals 1.14×10^6 litres - - the total sample volume can be adjusted by multiplying 1696.43 litres times the hours the sample was run (28 days = 672 hrs).

Gamma Analysis: Sequence File: 40 (charcoal Det. #3 and RM Analyzer)
50 (filter Det. #3 and RM Analyzer)
80 (filter Det. #1)

Count Time: 60 minutes for both charcoal and filter

VEGETATION SAMPLES

Vegetation samples are collected annually from the 100 Areas, including the 1301-N Riverbank Springs. Approximately 38 samples are collected each year.

Safety: Watch for spiders and snakes. Standard laboratory safety rules. RWP N-22 applies to certain 100-N Area sampling locations.

Special Tools or Equipment: Plastic and paper bags. Clippers to collect vegetation.

Prerequisites: Collect vegetation samples annually in June to allow sufficient time for new growth. EXCEPTION: collect riverbank springs vegetation annually in August to take advantage of low river flow.

Sample Collection:

(1) At all sample locations, if possible, the new growth of perennial vegetation (such as rabbitbrush or sagebrush) should be collected.

(2) In sample areas where no perennial vegetation occurs, the dominant vegetation should be collected.

(3) About one pound of vegetation should be collected.

(4) Special requirements for riverbank springs:

(a) Collect one sample from each zone as marked on the map.

(b) Collect the wide-blade grass (reed canarygrass) present along the springs -- attempt to collect grass growing above a visible spring.

Sample Type: Approximately one pound of vegetation in plastic bags.

Sample Preparation: The vegetation should be transferred to paper bags to speed the drying process. Be sure and label the paper bags with the sample identification number. After the vegetation has dried for 2-3 weeks, place the vegetation in a 4 litre Marinelli beaker. After weighing the sample, place the beaker in a plastic bag and seal the bag with tape, leaving room for the Marinelli to fit over the detector.

Sample Volume: Measure and record the weight of the dry vegetation in grams (net weight).

Gamma Analysis: Sequence File: 60 (Det. #3 and RM Analyzer)

Count Time: 8 hours

Follow-up: All vegetation samples should be sent to U.S. Testing for Sr-90 and Pu-239/240 analysis.

SOIL SAMPLES

Soil samples are collected annually from the 100 Areas. Approximately 30 samples are collected each year.

Safety: Watch for spiders and snakes. Standard laboratory safety rules. RWP N-22 applies to certain 100-N Area sampling locations.

Special Tools or Equipment: Petri dish, small digging tool (small shovel, large spoon, or large putty knife will work), 200 cc plastic jars.

Prerequisites: Soil samples should be collected once per year during May or June.

Sample Collection:

(1) To collect the soil samples, a petri dish and small digging tool (small shovel, large spoon, large putty knife, etc.) will be needed.

(2) Twist one half of the petri dish (the open side) into the ground and dig the soil out from around the petri dish.

(3) Remove the petri dish and skin off approximately the top centimetre of soil from the mound formed by the petri dish.

(4) Enough soil should be collected to fill a 200 cc jar at least 50% full.

(5) In areas where the soil is too rocky to use the petri dish, surface soil limited to the top centimetre should be removed without using the petri dish.

(6) Be sure and label soil samples correctly.

Sample Type: At least 100 cc of soil in 200 cc jars.

Sample Preparation: Make sure the soil is dry -- if the soil is not dry, remove the lid and allow the soil to dry for a few days. After weighing the sample, heat seal the 200 cc jar in a plastic bag.

Sample Volume: Measure and record the weight of the dry soil in grams (this is net weight -- the weight of the sample container must be subtracted).

Gamma Analysis: Sequence File: 10 (Det. #3)
40 (RM Analyzer)

Count Time: 8 hours

Follow-up: All soil samples should be sent to U.S. Testing for Sr-90 and Pu-239/240 analysis.

TRENCH SEDIMENT SAMPLES

Trench sediment samples are collected annually from nine locations in the 1301-N trench. These samples are highly radioactively contaminated and should be handled with care.

Safety:	Watch for spiders and snakes. Standard laboratory safety rules. RWP N-22 applies -- single SWP clothing must be worn while collecting samples.
Special Tools or Equipment:	Sediment core sampler or a long pole with a scoop on the end, 200 cc jars.
Prerequisites:	Sediment samples should be collected once per year during May or June.
Sample Collection:	Manholes are provided in the trench cover at the sample locations. Samples may be obtained by either using the core sampler (contact Environmental Control) or a long pole with a scoop on the end. Only a small amount of sediment should be collected (~25 cc). To avoid radiation exposure problems, do not collect more sediment than necessary. Be sure and label the sediment samples correctly.
Sample Type:	Approximately 25 cc of sediment in a 200 cc jar.
Sample Preparation:	The lids of the jars should be removed and the uncovered jars placed under the radiation hood in Room 50. The jars should be left under the hood until the sediment is dry. After weighing the sample, heat seal the 200 cc jar in a plastic bag.
Sample Volume:	Measure and record the weight of the dry sediment in grams (net weight).
Gamma Analysis:	Sequence File: 90 (Det. #3) Count Time: 2 minutes
Follow-up:	All trench sediment samples should be sent to U.S. Testing for Sr-90 and Pu-239/240 analysis.

GROUNDWATER SAMPLES

Groundwater samples are collected once every quarter at approximately 22 different monitoring wells at 100-N Area and four wells at 100-K Area.

Safety: Standard laboratory safety rules.

Special Tools or Equipment: Filters -- sharkskin and 45 μ size.

Prerequisites: None, other than the samples collected by PNL.

Sample Collection: The samples are collected by PNL once each quarter when they collect samples from the same wells for the Hanford Groundwater Monitoring Program.

Sample Type: One gallon liquid samples.

Sample Preparation: The samples must be filtered before counting. Funnel filter the groundwater through sharkskin and then filter the water again using a 0.45 μ size filter (this is the same size that PNL uses). Filters may be discarded. The filtered groundwater should be placed in a four litre Marinelli beaker. Refer to UNI-M-76 REV 1, Section 2.4 for further instructions on preparing liquid Marinelli samples.

Sample Volume: 4 litres.

Gamma Analysis: Sequence File: 10 (Det. #3)
20 (Det. #2)
90 (RM Analyzer)

Count Time: 8 hours

ENVIRONMENTAL DOSIMETERS

External radiation dose information is collected at 100-N Area using CaF_2:Mn (TLD-400) thermoluminescent dosimeters. The dosimeters used are delivered and picked up monthly by PNL where they are read, calibrated, and annealed.

100-N Area personnel should replace the dosimeters once every four weeks. TLDs should be placed at a height of approximately 1 metre. The new TLDs can be found in the lead brick "cave" maintained by Environmental Control (currently in Larry Diediker's office). After replacing the TLDs at all locations, the old TLDs should be returned to the lead brick cave.

Safety: Watch for spiders and snakes. RWP N-22 applies to some TLD locations.

Special Tools or Equipment: TLDs

Prerequisites: New TLDs must be available as replacements.

1301-N GRID SURVEY

A grid network of radiation survey locations is established adjacent to the 1301-N crib and trench. The survey locations are marked with an identification tag attached to a metal pole.

A direct reading count rate integrating instrument (an Eberline HP-210 probe with an Eberline Scaler) is used to measure activity and a μR meter (Ludlum Model 12S) is used to measure the dose rate at each location. All measurements are made at a height of approximately one metre. To obtain a count rate per minute, count at each survey location for two minutes and record one-half of the result.

Along with the information collected using the instruments, the following information should be recorded:

1) Reactor power level
2) Crib flow rate
3) Level of decontamination wastes in 1310-N tank
4) Level of decontamination wastes in the 1314-N tank
5) Status of wastes and level in the Emergency Dump Tank

The above information can be obtained from the 105-N Control Room or the Room 50 weekly analysis logbook.

Safety: Watch for spiders and snakes. RWP N-22 applies to the grid survey.

Special Tools or Equipment: Eberline HP-210 probe with Eberline Scaler, Ludlum Model 12 S μR meter..

Prerequisites: The grid survey should be conducted once per year during August, preferably during reactor operation. Results of the survey shall be sent promptly to Environmental Control.

SHORELINE SURVEY

A Columbia River shoreline radiation survey at 100-N Area covers the area beginning just downstream of the 181-N Building and ending about 1000 feet downstream of the 1323-N sample shed. Measurements are made approximately every 50 feet along the high water mark of the shoreline at a height of approximately one metre.

As in the grid survey, a direct reading count rate integrating instrument (an Eberline HP-210 probe with an Eberline Scaler) is used to measure activity and a μR meter (Ludlum Model 12S) is used to measure the dose rate at each location. To obtain a count rate per minute, count at each survey location for two minutes and record one-half of the result.

Along with the information collected using the instruments, the following information should be recorded:

1) Reactor power level
2) Crib flow rate
3) Level of decontamination wastes in 1310-N tank
4) Level of decontamination wastes in 1314-N tank
5) Status of wastes and level in the Emergency Dump Tank

The above information can be obtained from the 105-N Control Room or the Room 50 weekly analysis logbook.

Safety: Watch for spiders and snakes. Watch for slipping hazards along shoreline.

Special Tools or Equipment: Eberline HP-210 probe with Eberline Scaler, Ludlum Model 12 S μR meter.

Prerequisites: The shoreline survey should be conducted once per year during August, preferably during reactor operation. Results of the survey shall be sent promptly to Environmental Control.